GB

Blown type gas burners

Progressive two-stage or modulating operation

CE

RS

Code	Model	Type
	RS 70/E MZ	828 T2
	RS 70/E MZ	828 T2
	RS 100/E MZ	829 T2
	RS 100/E MZ	829 T2
	RS 130/E MZ	830 T2
	RS 130/E MZ	830 T2
3787630 - 3787632	RS 190/E	836 T2
3789200 - 3789210	RS 250/E MZ	866 T1
3789201 - 3789211	RS 250/E MZ	866 T1
3789230 - 3789240	RS 250/E MZ	866 T1
3789231 - 3789241	RS 250/E MZ	866 T1

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Declaration of conformity in accordance with ISO / IEC 17050-1

Manufacturer:	RIELLO S.p.A.
Address:	Via Pilade Riello, 7 37045 Legnago (VR)
Product:	Blown type gas burner
Model:	RS 70/E MZ RS 100/E MZ RS 130/E MZ RS 190/E RS 250/E MZ

These products are in compliance with the following Technical Standards:

EN 676
EN 292
EN 50 081-1
EN 50 082-1
EN 60 335

According to the European Directives:

GAD	90/396/EEC	Gas Devices Directive
MD	98/37/EEC	Machine Directive
LVD	73/23/EEC - 2006/95/EEC	Low Voltage Directive
EMC	89/336/EEC - 2004/108/EEC	Electromagnetic Compatibility

such products are marked as follows:

CE

CE-0085XXXXX (for RS 70/E MZ)
CE-0085XXXXX (for RS 100/E MZ)
CE-0085XXXXX (for RS 130/E MZ)
CE-0085XXXXX (for RS 190/E)
CE-0085XXXXX (for RS 250/E MZ)

Legnago, 26.06.2007

Mr. G. Conticini
Burners Division Department

The quality is guaranteed by a quality and management system certified in accordance with UNI EN ISO 9001.

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1.1 Information about the instruction manual

Introduction
The instruction manual supplied with the burner:

- ➤ is an integral and essential part of the product and must not be separated from it; it must therefore be kept carefully for any necessary consultation and must accompany the burner even if it is transferred to another owner or user, or to another system. If the manual is lost or damaged, another copy must be requested from the Technical Assistance Service RIELLO of the Area;
- ➤ is designed for use by qualified personnel;
- ➤ offers important indications and instructions relating to the installation safety, start-up, use and maintenance of the burner.

Symbols used in the manual
In some parts of the manual you will see triangular DANGER signs. Pay great attention to these, as they indicate a situation of potential danger.

GENERAL DANGERS

The **dangers** can be of **3 levels**, as indicated below.

Maximum danger level!
This symbol indicates operations which, if not carried out correctly, cause serious injury, death or long-term health risks.

This symbol indicates operations which, if not carried out correctly, may cause serious injury, death or long-term health risks.

This symbol indicates operations which, if not carried out correctly, may cause damage to the machine and/or injury to people.

DANGER: LIVE COMPONENTS

This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences.

Other symbols

ENVIRONMENTAL PROTECTION
This symbol gives indications for the use of the machine with respect for the environment.

➤ This symbol indicates a list.

Abbreviations used

Ch.	Chapter
Fig.	Figure
Page	Page
Sec.	Section
Tab.	Table

Delivery of the system and the instruction manual
When the system is delivered, it is important that:

- ➤ the instruction manual is consigned to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
- ➤ The instruction manual shows:
  the serial number of the burner;
  the address and telephone number of the nearest Assistance Centre.
- ➤ The system supplier must carefully inform the user about:
  - the use of the system,
  - any further tests that may be necessary before the system is started up,
  - maintenance and the need to have the system checked at least once a year by the manufacturer or another specialised technician.

  To ensure a periodic check, RIELLO recommends the drawing up of a Maintenance Contract.

1.2 Guarantee and responsibility

RIELLO guarantees its new products from the installation date, in accordance with the regulations in force and/or the sales contract. At the moment of the first start-up, check that the burner is integral and complete.

Failure to observe the information given in this manual, operating negligence, incorrect installation and the carrying out of non authorised modifications will result in the annulment by RIELLO of the guarantee that it supplies with the burner.
In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- ➤ incorrect installation, start-up, use and maintenance of the burner;
- ➤ improper, incorrect or unreasonable use of the burner;
- ➤ intervention of unqualified personnel;
- ➤ carrying out of non authorised modifications on the equipment;
- ➤ use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- ➤ installation of untested supplementary components on the burner;
- ➤ powering of the burner with unsuitable fuels;
- ➤ faults in the fuel power supply system;
- ➤ use of the burner even following an error and/or an irregularity;
- ➤ repairs and/or overhauls incorrectly carried out;
- ➤ modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- ➤ insufficient and inappropriate surveillance and care of those burner components most subject to wear and tear;
- ➤ use of non-original RIELLO components, including spare parts, kits, accessories and optionals;
- ➤ force majeure.

RIELLO furthermore declines any and every responsibility for the failure to observe the contents of this manual.

2.1 Introduction

The RIELLO burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations.
It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:
- ➤ The burner must only be used as expressly described. Any other use should be considered improper and therefore dangerous.

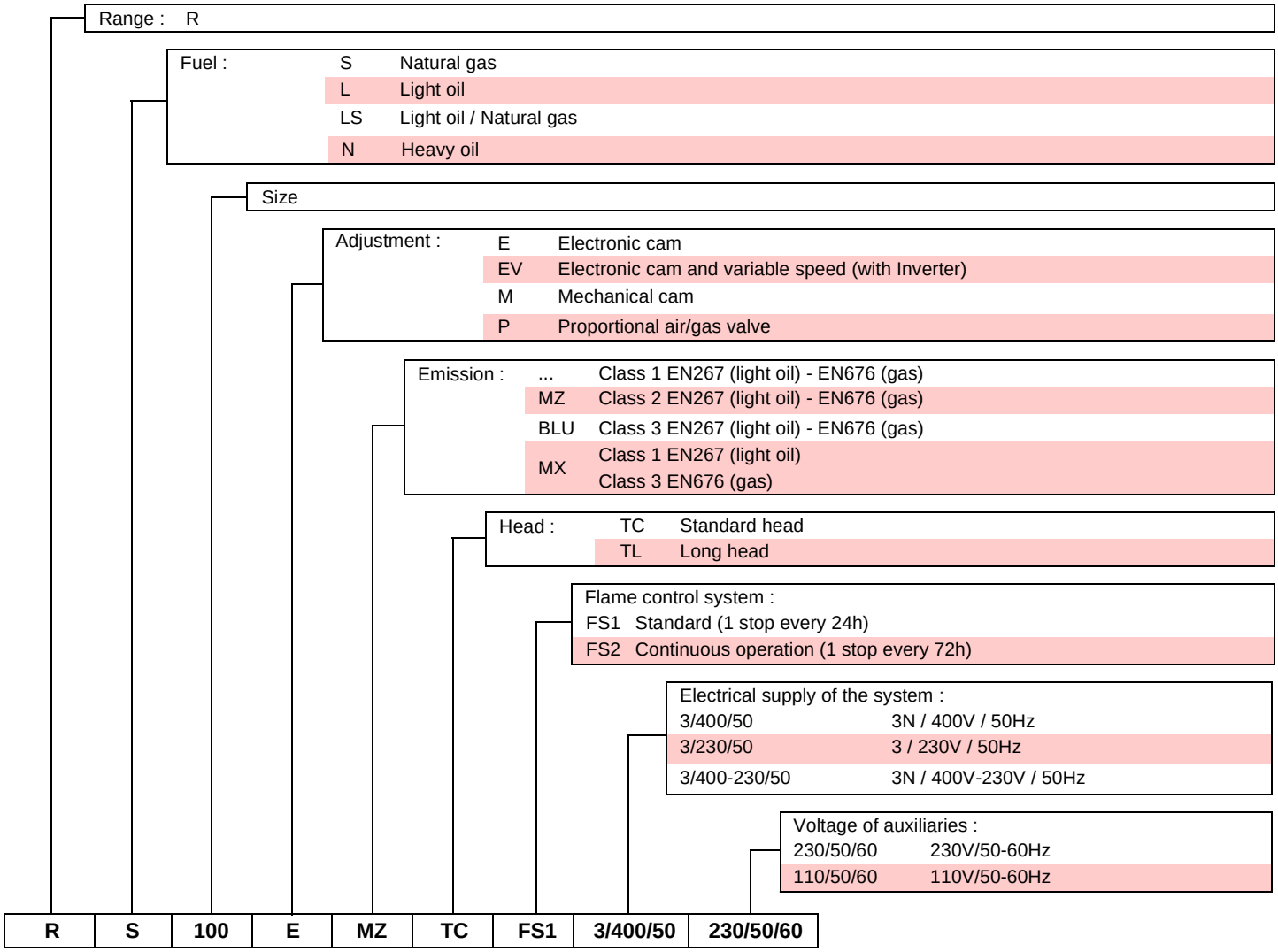
In particular:
it can be applied to boilers operating with water, steam, diathermic oil, and to other users expressly named by the manufacturer;
the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.
- ➤ Modification of the burner to alter its performance and destinations is not allowed.
- ➤ The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- ➤ Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- ➤ Only those parts envisaged by the manufacturer can be replaced.

2.2 Personnel training

The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.
The user:
- ➤ undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- ➤ must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- ➤ undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- ➤ must inform the Manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.
- ➤ Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.
- ➤ Personnel must follow all the danger and caution indications shown on the machine.
- ➤ Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- ➤ Personnel are obliged to inform their superiors of every problem or dangerous situation that may arise.
- ➤ The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The Manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

3 Technical description of the burner

3.1 Burner designation


Range : R
Fuel : S Natural gas
L Light oil
LS Light oil / Natural gas
N Heavy oil
Size
Adjustment : E Electronic cam
EV Electronic cam and variable speed (with Inverter)
M Mechanical cam
P Proportional air/gas valve
Emission : ... Class 1 EN267 (light oil) - EN676 (gas)
MZ Class 2 EN267 (light oil) - EN676 (gas)
BLU Class 3 EN267 (light oil) - EN676 (gas)
MX Class 1 EN267 (light oil) Class 3 EN676 (gas)
Head : TC Standard head
TL Long head
Flame control system :
FS1 Standard (1 stop every 24h)
FS2 Continuous operation (1 stop every 72h)
Electrical supply of the system :
3/400/50 3N / 400V / 50Hz
3/230/50 3 / 230V / 50Hz
3/400-230/50 3N / 400V-230V / 50Hz
Voltage of auxiliaries :
230/50/60 230V/50-60Hz
110/50/60 110V/50-60Hz
R S 100 E MZ TC FS1 3/400/50 230/50/60
BASIC DESIGNATION
EXTENDED DESIGNATION

3.2 Models available

Designation		Voltage	Code
RS 70/E MZ	TC	3 ~ 400 / 230V - 50Hz	
RS 70/E MZ	TL	3 ~ 400 / 230V - 50Hz	
RS 100/E MZ	TC	3 ~ 400 / 230V - 50Hz	
RS 100/E MZ	TL	3 ~ 400 / 230V - 50Hz	
RS 130/E MZ	TC	3 ~ 400 / 230V - 50Hz	
RS 130/E MZ	TL	3 ~ 400 / 230V - 50Hz	
RS 190/E	TC	3 ~ 400 / 230V - 50Hz	3787630 - 3787632
RS 250/E MZ	TC	3 ~ 400 / 230V - 50Hz	3789200 - 3789210
RS 250/E MZ	TL	3 ~ 400 / 230V - 50Hz	3789201 - 3789211
RS 250/E MZ	TC	3 ~ 230V - 50Hz	3789230 - 3789240
RS 250/E MZ	TL	3 ~ 230V - 50Hz	3789231 - 3789241

3.3 Burner categories - Countries of destination

Country of destination	Gas category
AT - CH - DK - FI - GR - IS - IT - NO - SE	$II_{2H3B/P}$
ES - GB - IE - PT	II_{2H3P}
NL	$II_{2L3B/P}$
FR	II_{2Er3P}
DE	$II_{2ELL3B/P}$
BE	$I_{2E(R)B}$, I_{3P}
LU	$II_{2E3B/P}$

3.4 Technical data

Model			RS 70/E MZ	RS 100/E MZ	RS 130/E MZ	RS 190/E	RS 250/E MZ
Type			828 T2	829 T2	830 T2	836 T2	866 T1
Output (1)	maximum	kW Mcal/h	465 - 814 400 - 700	698 - 1163 600 - 100	930 - 1512 800 - 1300	1279 - 2290 1100 - 1970	1250 - 2650 1075 - 2279
	minimum	kW Mcal/h	135 116	150 129	160 138	470 405	600 516
Fuel			Natural gas: G20 (methane gas) - G21 - G22 - G23 - G25				
Gas pressure at max. output (2) - Gas: G20/G25		mbar	in progress	in progress	in progress	14.9 / 22.3	19.4 / 29.1
Operation			Intermittent (min. 1 stop in 24 hours)				
Standard applications			Boilers: water, steam, diathermic oil				
Room temperature		°C	0 - 40				
Combustion air temperature		°C max	60				
Electrical supply			3 ~ 400V / 230 V 1N ~ 230V +/-10% 50 Hz (See Chap. 3.2)				
Fan motor (rating) Operating current Acceleration current		rpm V kW A A	2800 230/400 1.1 4.8 - 2.8 33 - 19	2800 230/400 1.5 5.9 - 3.4 48 - 28	2800 230/400 2.2 8.8 - 5.1 68 - 39	2800 230/400 4.5 15.8 - 9.1 126 - 72	2800 230/400 5.5 21.3 - 12.3 144 - 83
Ignition transformer		V1 - V2 I1 - I2	230 V - 1 x 8 kV 1 A - 20 mA				
Absorbed electrical power		kW max	1.6	2.0	2.8	5.3	6.5
Protection level			IP 44				
Compliance with EC Directives			98/37 - 90/396 - 89/336 - 2004108 - 73/23 - 2006/95				
Noise level (3)		dBA	75.0	77.0	78.5	83.1	83.0
Type-approval	class 2 (EN 676)	EC	in progress	in progress	in progress	-	in progress
	class 1 (EN 676)	EC	-	-	-	in progress	-

(1) Reference conditions: Room temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m above sea level.
(2) Pressure on the pressure switch socket Fig. 29 with zero pressure in the combustion chamber and at maximum burner output.
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum output.

3.5 Packaging

- The packaging of the burner rests on a wooden platform that is particularly suitable for lift trucks. The overall dimensions of the packaging are shown in the table.
- The weight of the burner complete with its packaging is shown in table.

mm	A	B	C	kg
RS 70/E MZ	1400	780	700	77-79
RS 100/E MZ	1400	780	700	80-82
RS 130/E MZ	1400	780	700	83-85
RS 190/E	1400	780	1000	89
RS 250/E MZ	1400	780	1000	124-126

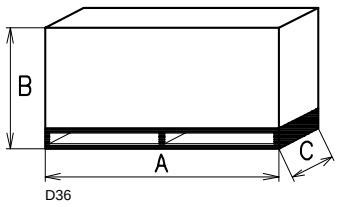


Fig. 1

3.6 Overall dimensions

The dimensions of the burner are shown in Fig. 2.
Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part drawn back on the guides.
The dimensions of the open burner are indicated by position I.

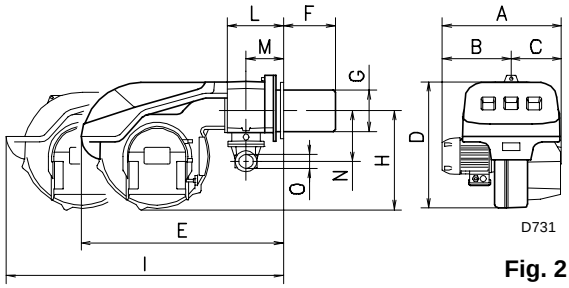


Fig. 2

mm	A	B	C	D	E	F (1)	G	H	I (1)	L	M	N	O
RS 70/E MZ	511	296	215	555	840	250-385	179	430	1161-1296	214	134	221	2”
RS 100/E MZ	527	312	215	555	840	250-385	179	430	1161-1296	214	134	221	2”
RS 130/E MZ	553	338	215	555	840	280-415	189	430	1161-1296	214	134	221	2”
RS 190/E	675	370	305	555	872	372	222	436	1328	230	150	223	2”
RS 250/E MZ	732	427	305	555	872	370-520	222	436	1322-1467	230	150	264	2”

(1) Blast tube: short-long

3.7 Firing rates

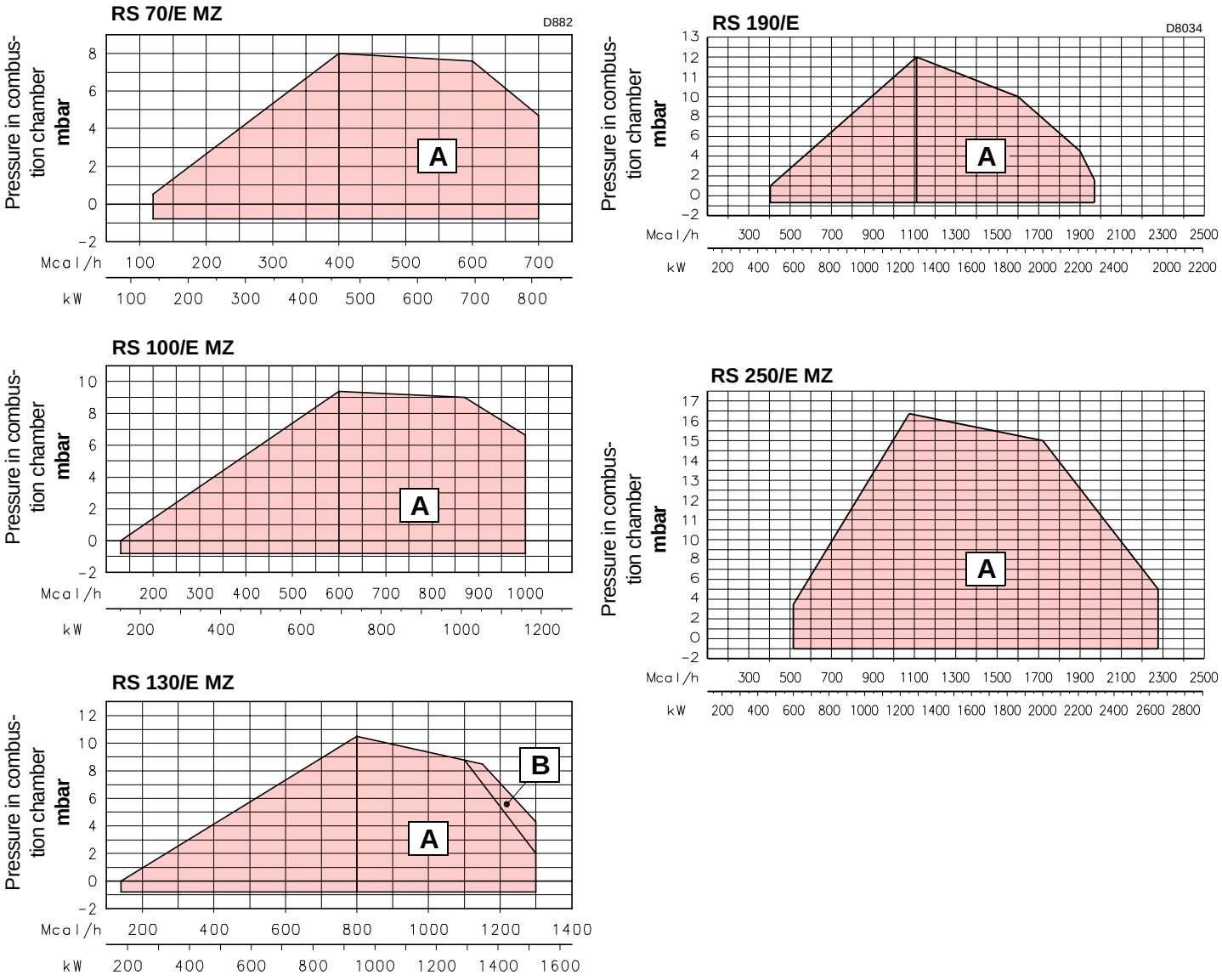


Fig. 3

The **maximum output** is chosen within area A (and B for RS 130/E MZ) of the diagram.
Note: to use area B (RS 130/E MZ) as well, the pre-calibration of the combustion head is necessary, as explained in Chap. 4.6.

The **minimum output** must not be lower than the minimum limit of the diagram.

Warning
The firing rate was obtained considering a room temperature of 20°C and an atmospheric pressure of 1013 mbar (approx. 0 m above sea level), with the combustion head adjusted as shown in Ch. 4.7.

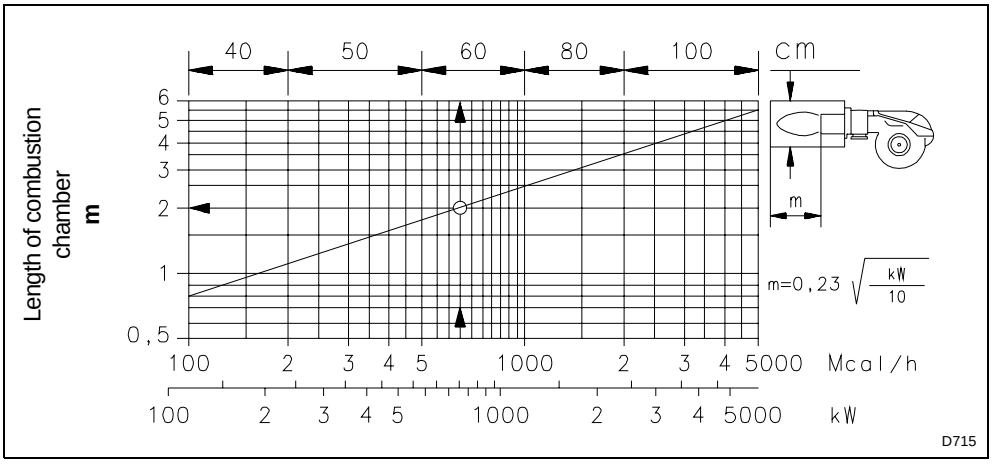


Fig. 4

The firing rates were obtained in special test boilers, according to EN 676 regulations.
Fig. 4 indicates the diameter and length of the test combustion chamber.

Example
Output 756 kW (650 Mcal/h):
diameter 60 cm,
length 2 m.

The coupling is ensured when the boiler is EC type-approved; for boilers or ovens with combustion chambers of very different dimensions compared to those shown in the diagram of Fig. 4, preliminary checks are recommended.

3.8 Burner components

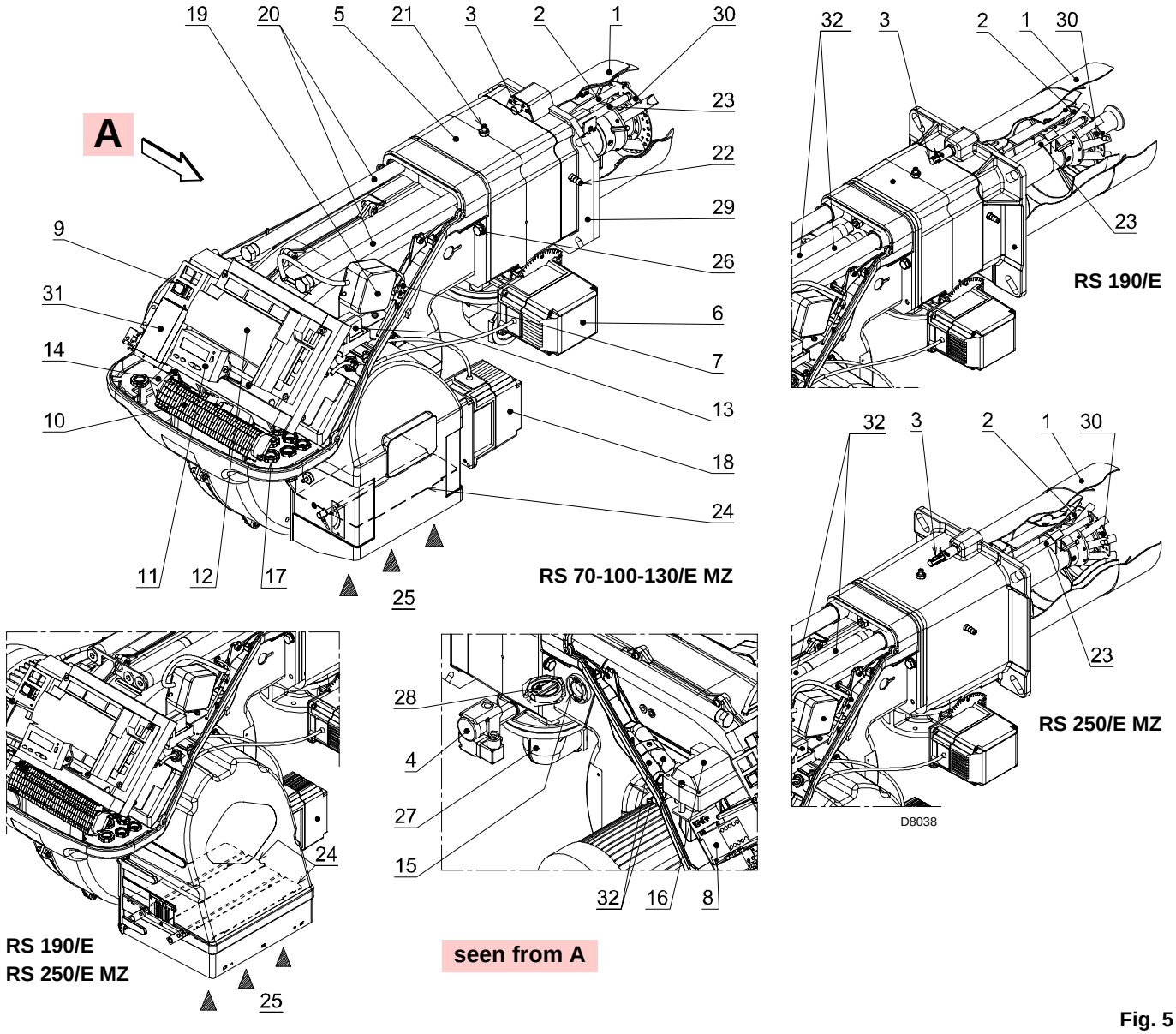


Fig. 5

1 Combustion head
2 Ignition electrode
3 Screw for combustion head adjustment
4 Maximum gas pressure switch
5 Pipe coupling
6 Gas servomotor
7 Plug-socket on ionisation probe cable
8 Motor contact maker and thermal relay with reset button
9 Operation on/off switch
10 Terminal board for electrical wiring
11 Operator Panel with LCD display
12 Control box for checking flame and air/fuel ratio
13 Clean contacts relay
14 Filter to protect against radio disturbance
15 Flame inspection window
16 Ignition transformer
17 Cable grommets for electrical wiring (to be carried out by the installer)
18 Air servomotor
19 Air pressure switch (differential type)
20 Guides for opening the burner and inspecting the combustion head
21 Gas pressure test point and head fixing screw
22 Air pressure socket
23 Flame sensor probe
24 Air damper
25 Fan air inlet
26 Screws to secure fan to pipe coupling
27 Gas input pipe
28 Gas butterfly valve
29 Boiler fixing flange
30 Flame stability disc
31 Bracket for application of output regulator RWF40
32 Extensions for guides 20) - only for TL versions

3.9 Burner equipment

The burner is supplied complete with:
- ➤ Gas train flange
- ➤ Flange gasket
- ➤ 4 screws to fix the flange: M10 x 35 for RS 70-100-130/E MZ, M10 x 40 for RS 190/E - RS 250/E MZ
- ➤ Thermal insulation screen
- ➤ 4 Screws to fix the burner flange to the boiler: M12 x 35 for RS 70-100-130/E MZ, M16 x 40 for RS 190/E - RS 250/E MZ
- ➤ N° 2 Screws M4 x 7 (for RS 190/E and RS 250/E MZ only)
- ➤ Extensions 32) for guides 20): TL versions only
- ➤ Disc (for RS 190/E and RS 250/E MZ only)
- ➤ Small disc (for RS 190/E and RS 250/E MZ only)
- ➤ PVP kit for leak detection (supplied as standard with RS 130/E MZ, RS 190/E and RS 250/E MZ, accessory supplied on request for RS 70/E and RS 100/E - see Appendix B)
- ➤ Instruction manual
- ➤ Spare parts list

3.10 Control box for the air/fuel ratio

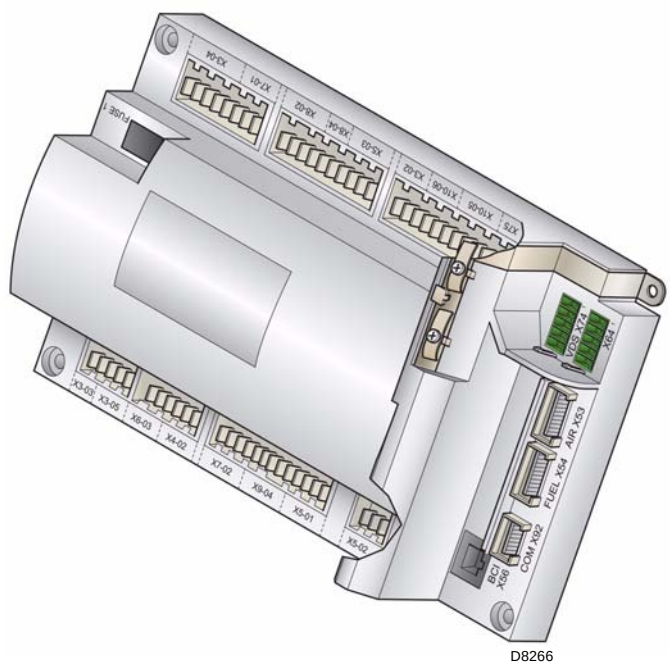


Fig. 6

Introduction
The control box for the air/fuel ratio (hereafter referred to simply as the control box), that equips the burners of the **RS** range, carries out a series of integrated functions in order to optimise burner functioning, both for single operation and together with other units (e.g. double furnace boiler or more than one generator at the same time).

The basic functions carried out by the control box relate to:
1. flame control;
2. the dosage of air and fuel via the positioning (with direct servocontrol) of the relative valves, excluding the possible play in the mechanical cam calibration systems;
3. the modulation of burner output, on the basis of the load requested by the system, maintaining the pressure or temperature of the boiler at the working values set;
4. the safety diagnostic of the air and fuel circuits, via which it is possible to easily identify any causes of malfunctioning.

Further interfaces and computer communication functions (for remote control or integration in central supervision systems) are available according to the system configuration.

WARNING

NOTE
The first start-up, like every further operation for the internal settings of the control box, requires access by means of a password and is only to be carried out by personnel of the Technical Assistance Service who have been specifically trained in the internal programming of the tool.
The information for the first start-up is given below.

Technical Data

Electrical supply	AC 230 V - 15% / +10%
Frequency	50/60 Hz +/- 6%
Internal fuse	6.3 A T
Operation below the nominal value of electrical supply	
Minimum operation value on reduction of electrical supply below nominal value	approx. AC 186 V
Minimum operation value on increase in electrical supply towards nominal value	approx. AC 195 V
Maximum load of the contacts:	
Fan motor relay Nominal power supply Nominal current Output factor	 AC 230 V, 50/60 Hz 2 A cosφ > 0.4
Alarm exit Nominal power supply Nominal current Output factor	 AC 230V, 50/60 Hz 1A cosφ > 0.4
Ignition transformer Nominal power supply Nominal current Output factor	 AC 230 V, 50/60 Hz 2 A cosφ > 0.2
Fuel valves Nominal power supply Nominal current Output factor	 AC 230 V, 50/60 Hz 2 A cosφ > 0.4
Operator Panel Nominal power supply Protection level Input power	 DC 5 V IP 40 < 50 mW
Length of cables Electrical supply line AC 230V Display	 max. 100m (100 pF/m) max. 3m (100 pF/m)
Output regulator **Remote reset button**	max. 20m (100 pF/m) max. 20m (100 pF/m)

3.11 Servomotors

Introduction

The servomotors that equip the burners of the **RS** range work directly on the air damper and the gas butterfly valve, without mechanical leverages but via the interposition of an elastic coupling.

They are commanded by the control box, which constantly checks their position by means of a return signal from the optic sensor inside the servomotor.

WARNING

For this reason it is absolutely forbidden to remove the cover of the servomotors.

The position (in degrees) of the servomotors can be seen on the display of the Operator Panel. See Ch. 5.18, Parameter 922, index **"0"** for fuel servomotor, index **"1"** for air servomotor.

The servomotors are electrically connected to the control box by means of RAST 2.5 type connectors.

When servicing or replacing the servomotors, take care not to invert the connectors. Follow the indications given in the electrical layouts or the silkscreen printing on the control box cover.

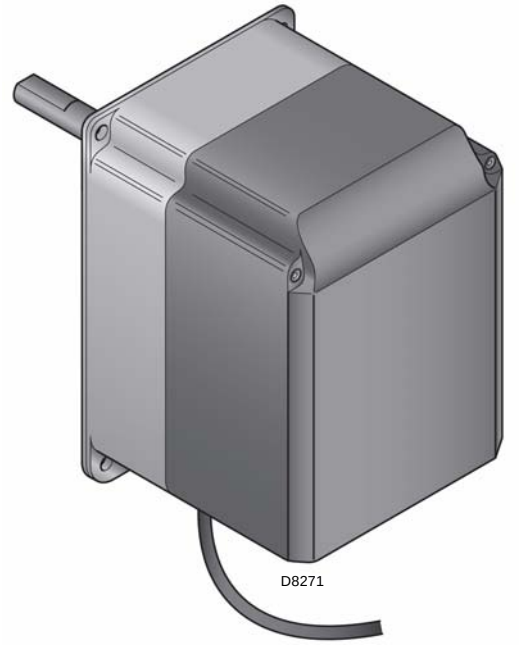


Fig. 7

Technical Data

	Fuel servomotor	Air servomotor
Model	SQM33.4..	SQM33.5..
Type of motor	Stepping motor	
Electrical supply	AC/DC 24V	
IP	IP54	
Firing rate	0 - 90°	
Opening time 0-90°	min: 5 s, max.: 120 s depending on the type of control box	
Torque	1.2 Nm	3 Nm
Input power	7.5 W	10 W
Rotation	Clockwise/anticlockwise (can be selected from the control box)	

4.1 Notes on safety for the installation

After carefully cleaning all around the area where the burner will be installed, and arranging the correct lighting of the environment, proceed with the installation operations.

DANGER

All the installation, maintenance and disassembly operations must be carried out with the electricity supply disconnected.

WARNING

The installation of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.

4.2 Handling

The packaging of the burner includes a wooden platform (see Ch. 3.5), so it is possible to move the burner (still packaged) with a transpallet truck or fork lift truck.
With regard to the transport in the obligatory passages, refer to the overall dimensions shown in Fig. 1.

WARNING

The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitableness of the available means of handling.
Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).
During the handling, keep the load at not more than 20-25 cm from the ground.

CAUTION

After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.
Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

4.3 Preliminary checks

Checking the consignment

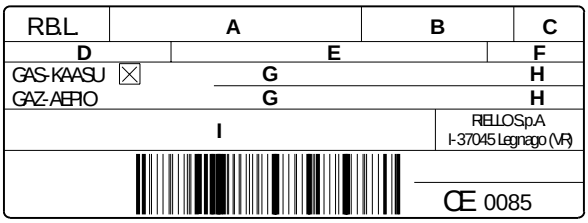
CAUTION

After removing all the packaging, check the integrity of the contents. In the event of doubt, do not use the burner; contact the supplier.

The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

Checking the characteristics of the burner
Check the identification label of the burner, showing:

- ➤ the model (see **A** in Fig. 8) and type of burner (**B**);
- ➤ the year of manufacture, in cryptographic form (**C**);
- ➤ the serial number (**D**);
- ➤ the data for electrical supply and the protection level (**E**);
- ➤ the electrical input power (**F**);
- ➤ the types of gas used and the relative supply pressures (**G**);
- ➤ the data of the burner's minimum and maximum output possibilities (**H**) (see Firing rate)
  Warning. The output of the burner must be within the boiler's firing rate;
- ➤ the category of the device/countries of destination (**I**).



D7738

Fig. 8

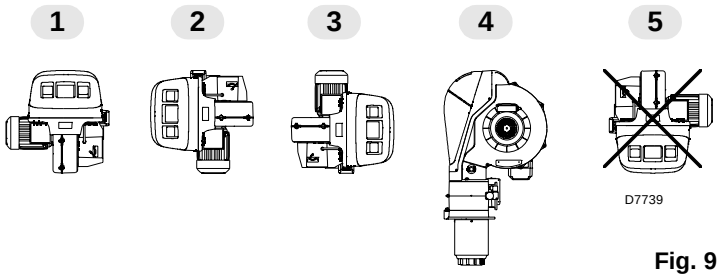
WARNING

A burner label that has been tampered with, removed or is missing, along with anything else that prevents the definite identification of the burner and makes any installation or maintenance work difficult.

4.4 Working position

The burner is designed to operate only in the positions **1**, **2, 3 and 4**.
Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual. Installations **2**, **3 and 4** permit operation but make maintenance and inspection of the combustion head more difficult.

Any other position could compromise the correct operation of the appliance. Installation **5** is prohibited for safety reasons.



D7739

Fig. 9

4.5 Securing the burner to the boiler

Preparing the boiler

Boring the boiler plate

Make holes in the plate shutting off the combustion chamber, as illustrated in Fig. 10. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

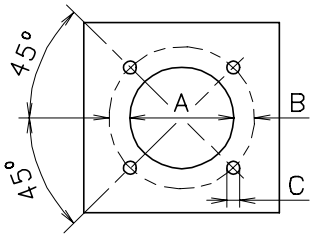


Fig. 10

mm	A	B	C
RS 70/E MZ	185	275-325	M 12
RS 100/E MZ	185	275-325	M 12
RS 130/E MZ	195	325-368	M 16
RS 190/E	230	325-368	M 16
RS 250/E MZ	230	325-368	M 16

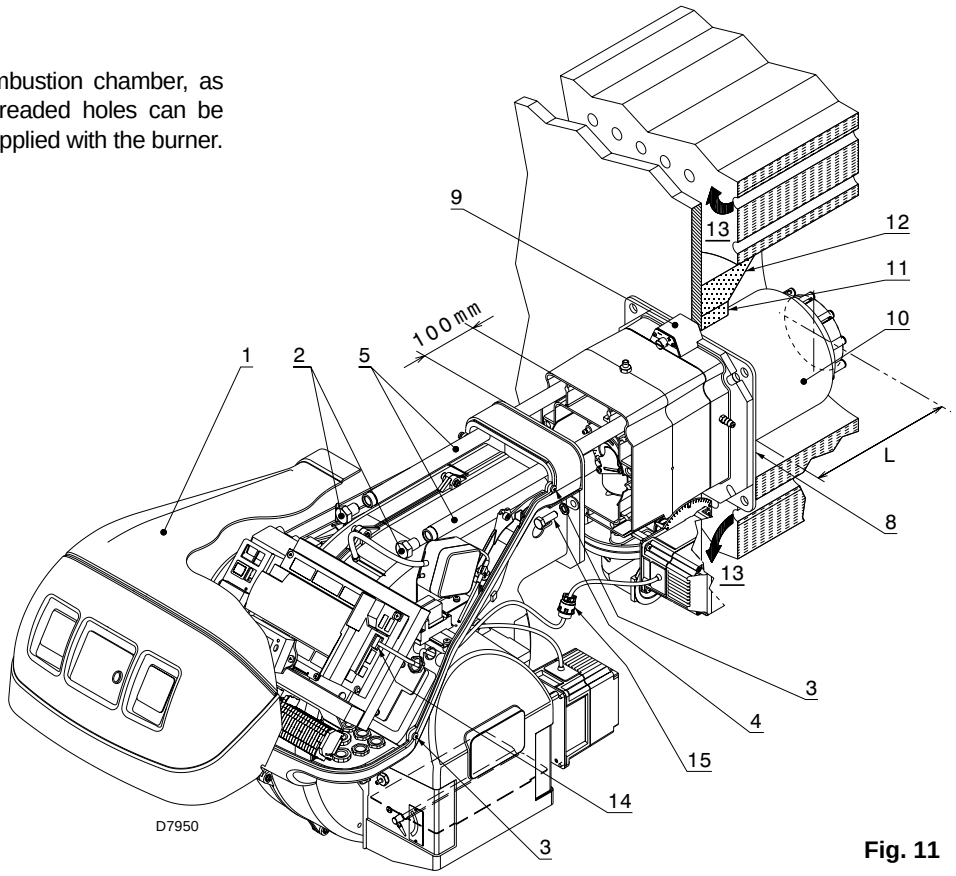


Fig. 11

Length of the blast tube

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its refractory. The available lengths L are those indicated in the table below.

For boilers with front flue passes 13) or flame inversion chambers, a protection in refractory material 11) must be inserted between the boiler refractory 12) and the blast tube 10). This protection must not compromise the extraction of the blast tube. See Fig. 11.

For boilers with a water-cooled frontal, a refractory lining is not necessary 11)-12) unless expressly requested by the boiler manufacturer.

Blast tube 10)	RS 70/E MZ	RS 100/E MZ	RS 130/E MZ	RS 190/E	RS 250/E MZ
• short	250 mm	250 mm	280 mm	372 mm	370 mm
• long	385 mm	385 mm	415 mm	-	520 mm

Securing the burner to the boiler
Before fixing the burner to the boiler, check from the opening of the blast tube that the probe and the electrode are correctly positioned, as in Fig. 12.

If, in the previous check, the position of the probe or electrode was not correct, remove the screw 1)(Fig. 13), extract the inner part 2)(Fig. 13) of the head, and adjust them.
Do not rotate the probe: leave it as in Fig. 12; if it is located too close to the ignition electrode, the control box amplifier may be damaged.

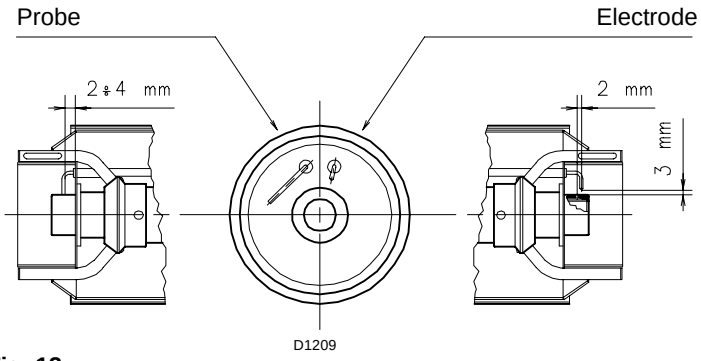


Fig. 12

Separate the combustion head from the rest of the burner, Fig. 11.
To do this, proceed as follows:
- ➤ loosen the 4 screws 3) and remove the hood 1);
- ➤ remove the screws 2) from the two guides 5);
- ➤ disconnect the plug 14), unscrew the grommet 15);
- ➤ disconnect the socket from the maximum gas pressure switch;
- ➤ remove the two screws 4);
- ➤ pull back the burner on the guides 5) by about 100 mm;
- ➤ disconnect the probe and electrode leads, then unthread the burner completely from the guides.

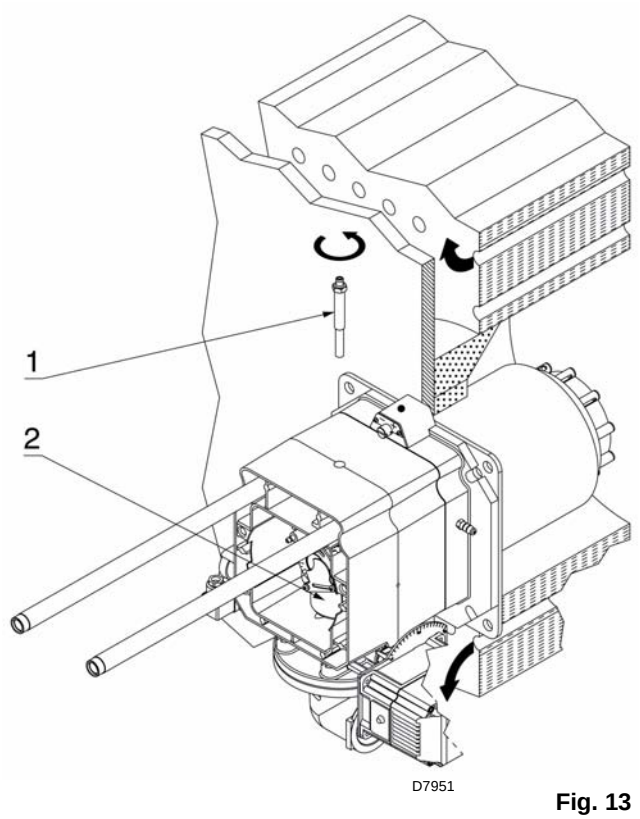


Fig. 13

Before fixing the burner to the boiler, check (for the model RS 130/E MZ) if its maximum output is included in area A or B of the firing rate. See Fig. 3.
If it is in area A, no intervention is required.
If it is in area B, it is necessary to pre-calibrate the combustion head, as described in Ch. 4.6.

Once this operation has been carried out, fix the flange 9)(Fig. 11) to the boiler plate, interposing the insulating gasket 8)(Fig. 11) supplied.
Use the 4 screws supplied, with a tightening torque of 35 - 40 Nm, after protecting their thread with anti-seize products.
The seal between burner and boiler must be airtight. After the start-up (see Ch. 5.8), check there is no leakage of flue gases into the external environment.

4.6 Pre-calibration of the combustion head (only for the model RS 130/E MZ)

CAUTION

See Fig. 14.
- ➤ Unscrew screws 1) and dismantle the blast tube 2).
- ➤ Move the fixing point of the rod 3) from position A to position B, thereby moving the shutter 4 backwards).
- ➤ Reassemble the blast tube 2) and the screws 1).

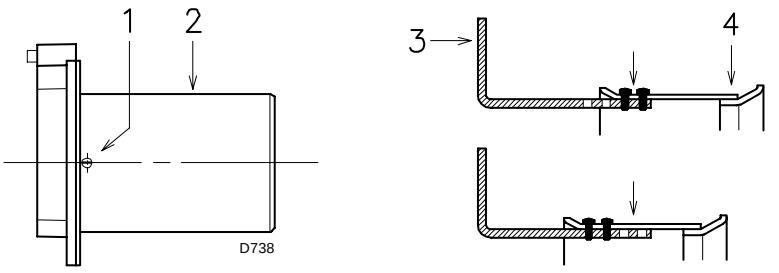


Fig. 14

4.7 Combustion head adjustment

At this point of the installation, the combustion head is fixed to the boiler as shown in Fig. 13. It is therefore especially easy to adjust, and this adjustment depends only on the maximum output of the burner.
Two adjustments of the head are foreseen:
➤ the air adjustment;
➤ the gas adjustment.

In the diagram of Fig. 17, find the notch at which to adjust both air and central gas/air.

Air adjustment
Rotate the screw 2) until the notch you have found corresponds with the front surface 1) of the flange.

CAUTION

Important
To facilitate adjustment, loosen the screw 3), adjust and then lock.

Gas adjustment (RS 70-100-130/E MZ)
Loosen the 4 screws and turn ring 5) until the notch identified is aligned with index 6).
Tighten the 3 screws 4) fully down.

Gas adjustment (RS 190/E - RS 250/E MZ)
When the burner is installed for maximum burner output ≤ 1300 Mcal/h (approx. 1500 kW) fit the discs 1)-2)(Fig. 16), supplied as part of the standard equipment, removing the internal tube 3)(Fig. 16). If the mains gas pressure is low, the head can be left in the standard set-up, limiting the modulation minimum to 450 Mcal/h (approx. 520 kW).

Example
RS 70/E MZ, burner output = 581 kW.
According to diagram Fig. 17 the gas and air adjustments for this output are carried out on notch 3.

NOTE
The diagram indicates the optimum adjustment for a type of boiler according to Fig. 4.

RS 190/E - RS 250/E MZ

RS 70-100-130/E MZ

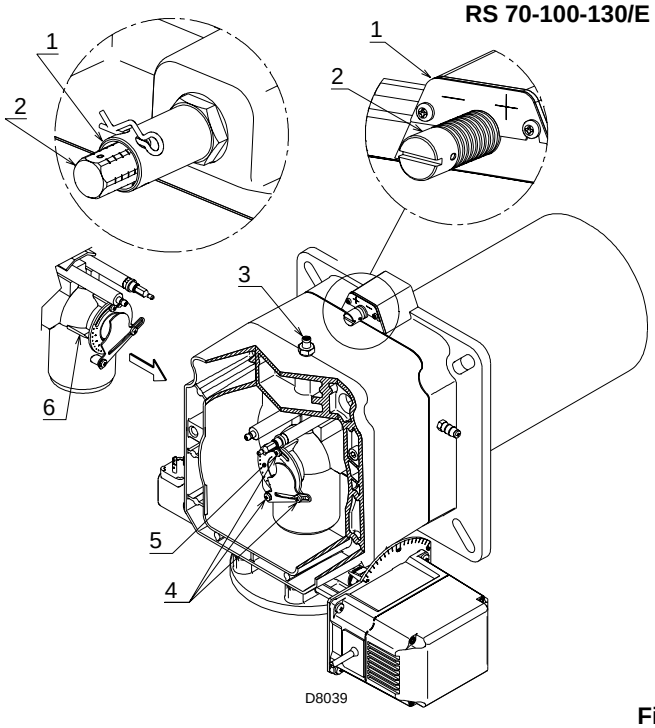


Fig. 15

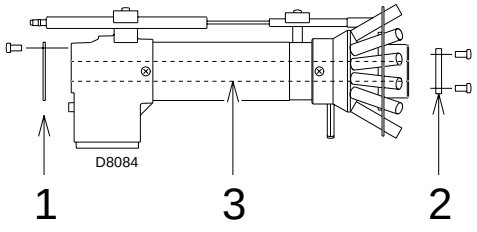
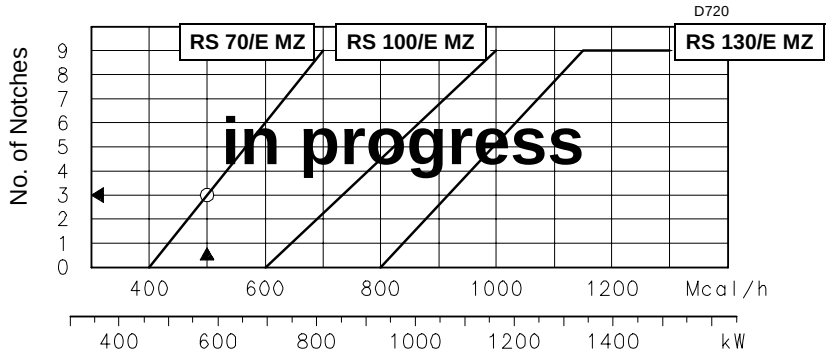


Fig. 16



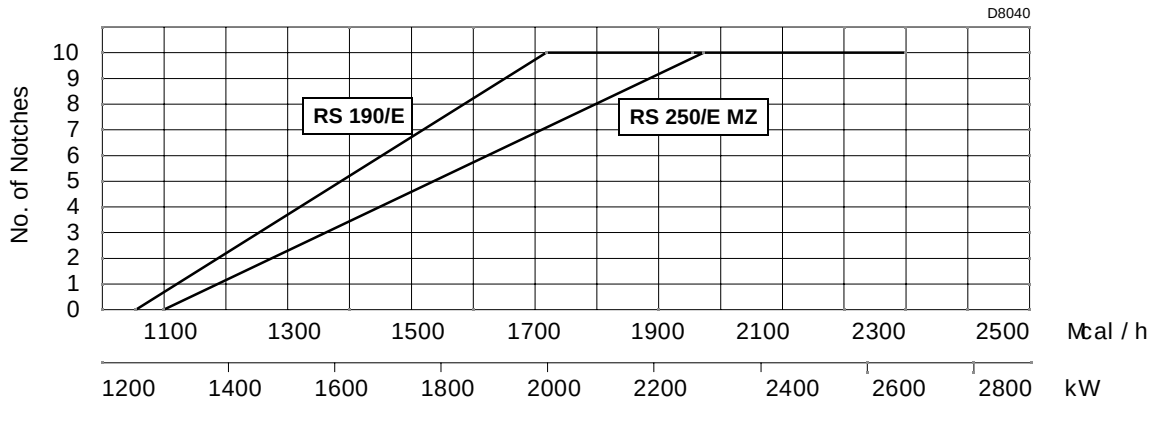


Fig. 17

Once the combustion head adjustment is completed:

- ➤ reassemble the burner on the guides 3) at about 100 mm from the pipe coupling 4) - burner in the position shown in Fig. 11;
- ➤ insert the probe and electrode cables, then slide the burner as far as the pipe coupling - burner in the position shown in Fig. 18;
- ➤ connect the plug of the servomotor 14) (Fig. 11) and tighten the cable grommet 15) (Fig. 11);
- ➤ connect the socket of the maximum gas pressure switch;
- ➤ refit the screws 2) on the guides 3);
- ➤ fix the burner to the pipe coupling with the screws 1).

CAUTION

When fitting the burner on the two guides, it is advisable to gently draw out the high voltage cable and flame detection probe cable until they are slightly taut.

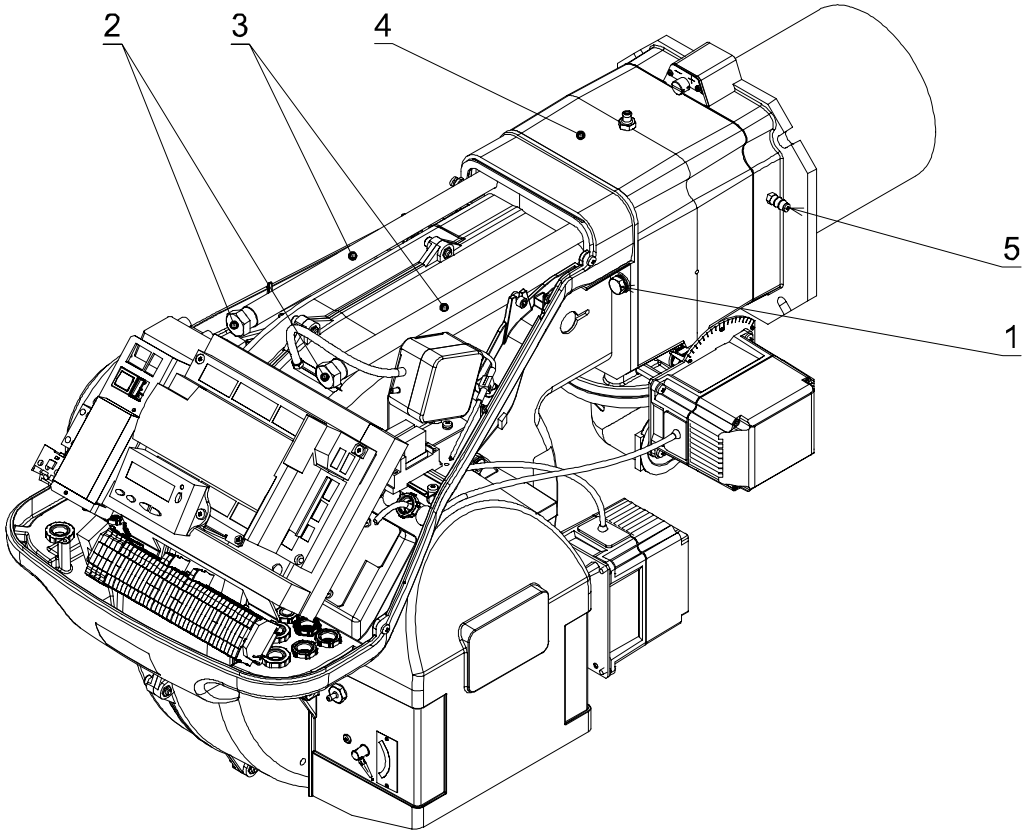


Fig. 18

D7975

4.8 Assembly of the gas train

➤ The gas train is type-approved according to standard EN 676 and is supplied separately from the burner, with the code indicated in Appendix B.

➤ The gas train can enter the burner from the right or left side, depending on which is the most convenient, see Fig. 19.

➤ The gas train must be connected to the gas attachment 1)(Fig. 19) with the flange 2), the gasket 3) and the screws 4) supplied with the burner.

➤ The gas solenoids must be as close as possible to the burner, to ensure that the gas reaches the combustion head within the safety time of 3 s.

➤ Ensure that the maximum pressure necessary for the burner is included in the calibration field of the pressure adjuster (colour of the spring): gas train MBC-1900-SE.

WARNING

See the accompanying instructions for the adjustment of the gas train.

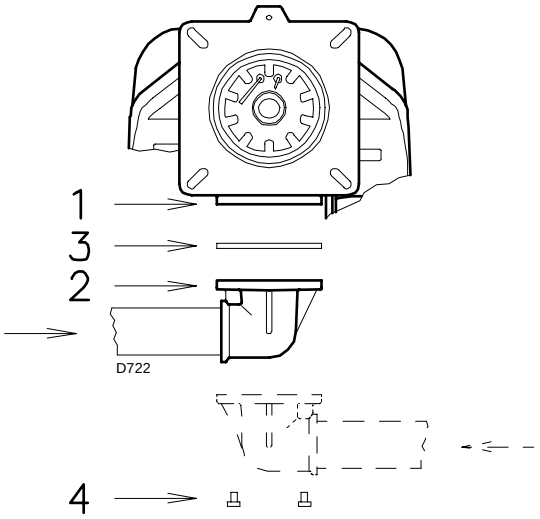


Fig. 19

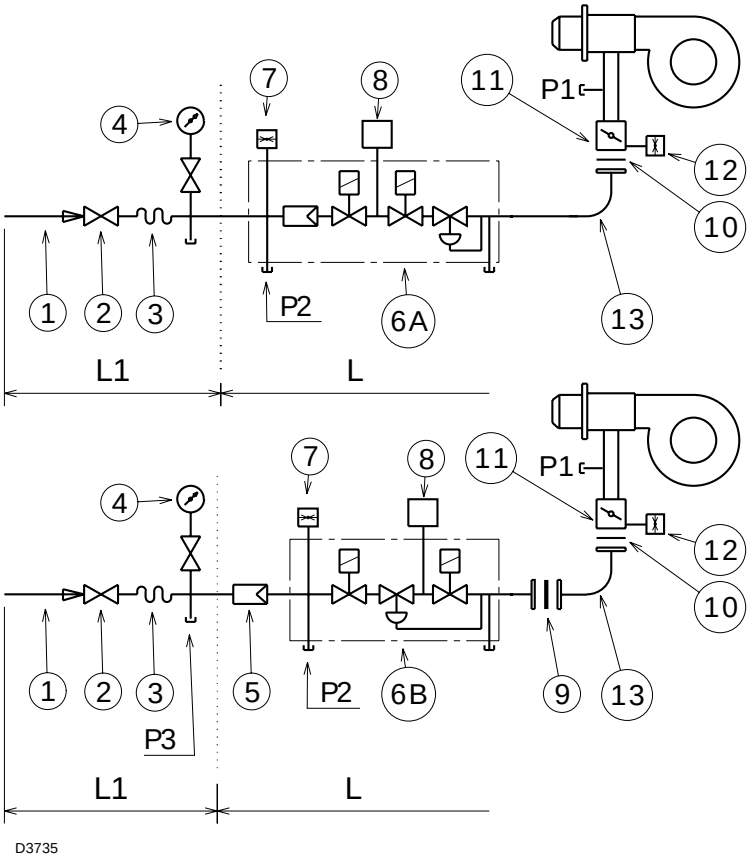


Fig. 20

1 - Gas input pipe
2 - Manual valve
3 - Vibration damping joint
4 - Pressure gauge with pushbutton cock
5 - Filter
6A - "Threaded" multibloc including:
- filter (can be replaced)
- safety valve
- working valve
- pressure adjuster

6B - "Flanged" multibloc including:
- safety valve
- working valve
- pressure adjuster

7 - Minimum gas pressure switch
8 - Valve leak detection control device. In accordance with the standard EN 676, leak detection is compulsory for burners with maximum outputs of more than 1200 kW.
9 - Gasket
10 - Gasket supplied with burner
11 - Gas adjustment butterfly valve
12 - Maximum gas pressure switch
13 - Gas train/burner adaptor
- supplied with burner
- supplied on request separately from the gas train for the flanged versions

P1 - Pressure at combustion head
P2 - Upstream pressure of valves/adjuster
P3 - Pressure upstream from the filter

L - Gas train supplied separately with the code indicated in Appendix B.
L1 - The responsibility of the installer

The losses of load along the gas supply line are indicated in Appendix C.

4.9 Electrical wiring

Notes on safety for the electrical wiring

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the electrical layouts given in Appendix A.
- RIELLO declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual. See Fig. 8.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to firing failure.
- The burners RS 70-100-130-190-250/E have been type-approved for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally the boiler's thermostat/pressure switch ensures the stopping of the burner.
  If this is not the case, it is necessary to apply in series with IN a timer switch that turns off the burner at least once every twenty-four hours. Refer to the electrical layouts given in Appendix A.

DANGER

- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum input power of the device,as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use an omnipolar switch with an opening of at least 3 mm between the contacts, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

If the hood is still present, remove it and proceed with the electrical wiring according to the layouts shown in Appendix A.

Use flexible cables according to standard EN 60 335-1.

All the cables to be connected to the burner are fed through the grommets. See Fig. 21.
The use of the cable grommets can take various forms. By way of example we indicate the following mode:

1 - Three-phase power supply
2 - Single phase power supply
3 - Consents/safety
4 - Minimum gas pressure switch
5 - Gas valves
6 - Available

Cable grommets used in the factory:
A - Fan motor
B - Maximum gas pressure switch
C - Gas servomotor
D - Air servomotor

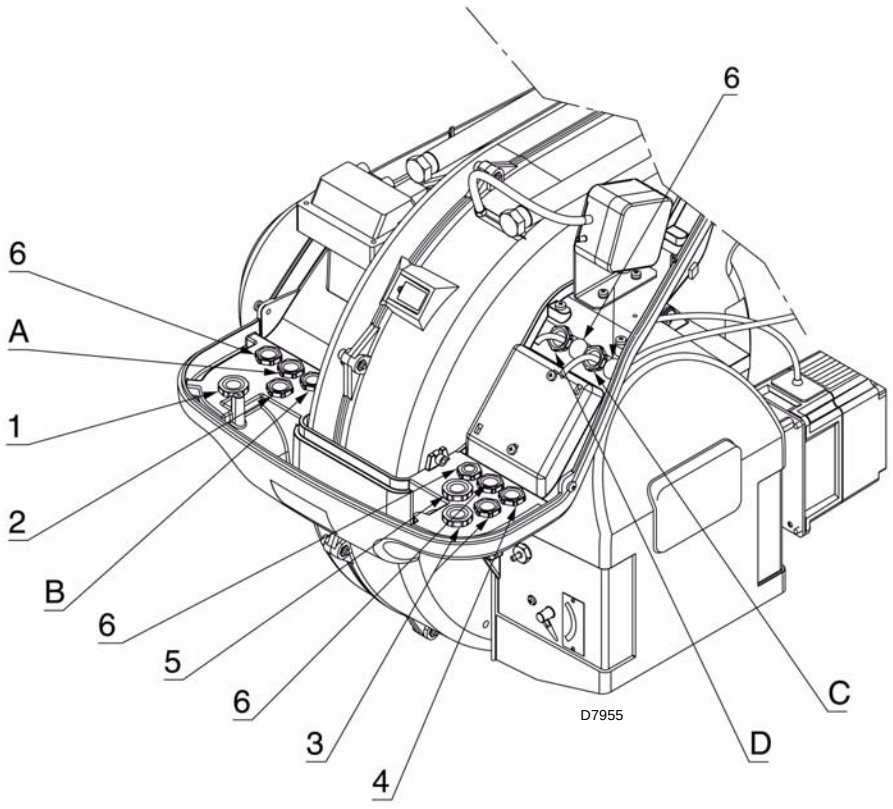


Fig. 21

4.10 Calibration of the thermal relay

The thermal relay is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

For the calibration, refer to the table given in electrical layout no. 6 in Appendix A.

If the minimum value of the scale of the thermal relay is greater than the rating absorption of the motor, protection is still ensured. This arises when the power supply of the motor is 400 V.
To reset, in the case of an intervention of the thermal relay, press the button 1) of Fig. 22.

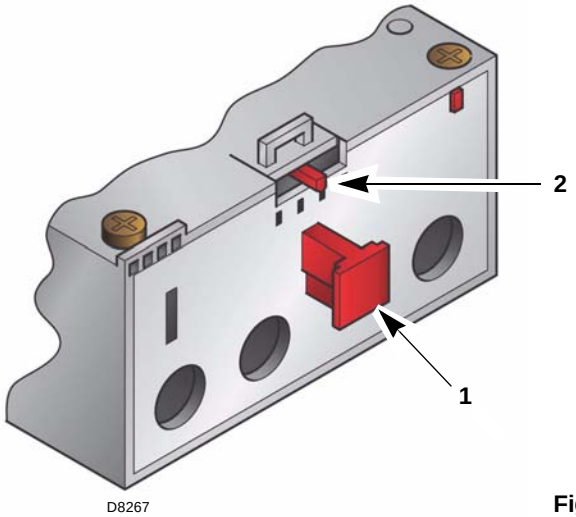


Fig. 22

5.1 Notes on safety for the first start-up

WARNING

The first start-up of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.

WARNING

Check the correct working of the adjustment, command and safety devices.

5.2 Operations before start-up

- ➤ Ensure that the gas supply Company has carried out the supply line vent operations, eliminating air or inert gases from the piping.
- ➤ Slowly open the manual valves situated upstream of the gas train.
- ➤ Adjust the minimum gas pressure switch to the start of the scale.
- ➤ Adjust the maximum gas pressure switch to the end of the scale.
- ➤ Adjust the air pressure switch to the start of the scale.
- ➤ Adjust the pressure switch for the valve leak detection control device (PVP Kit), if present, according to the instructions supplied with the Kit itself.

Minimum gas pressure switch

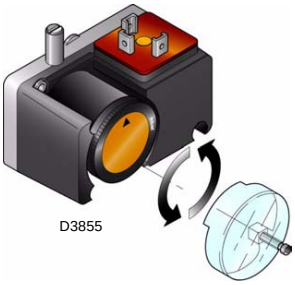


Fig. 23

Maximum gas pressure switch

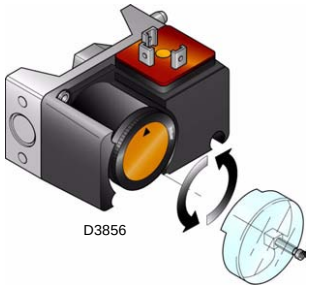


Fig. 24

Air pressure switch

Fig. 25

Pressure switch PVP Kit

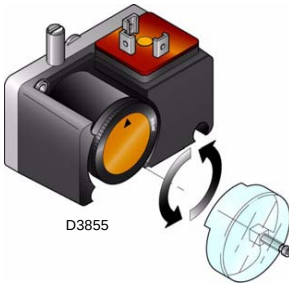


Fig. 26

- ➤ Check the gas supply pressure by connecting a pressure gauge to the pressure test point 1)(Fig. 27) of the minimum gas pressure switch: it must be lower than the maximum allowed pressure of the gas train, as shown on the characteristics label.

DANGER

An excessive gas pressure can damage the components of the gas train and lead to a risk of explosion.

- ➤ Bleed the air from the piping of the gas train, connecting a plastic tube to the pressure test point 1)(Fig. 27) of the minimum gas pressure switch.
  Take the vent tube outside the building so you can notice the smell of gas.
- ➤ Connect two lamps or testers to the two gas line solenoids to check the exact moment at which voltage is supplied.
  This operation is unnecessary if each of the two solenoids is equipped with an indicator light that signals voltage passing through.

WARNING

Before starting up the burner, it is good practice to adjust the gas train so that ignition takes place in conditions of maximum safety, i.e. with gas delivery at the minimum.

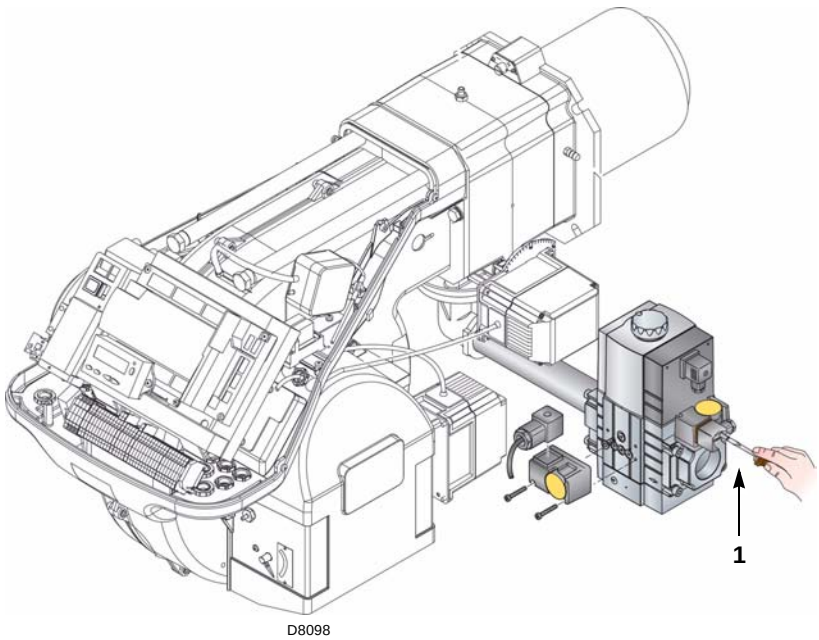


Fig. 27

5.3 Burner start-up

Feed electricity to the burner via the disconnecting switch on the boiler panel.
Close the thermostats/pressure switches and turn the switch of Fig. 28 to position **"1"**.

DANGER

Make sure that the lamps or testers connected to the solenoids, or indicator lights on the solenoids themselves, show that no voltage is present. If voltage is present, stop the burner **immediately** and check the electrical wiring.

Carry out the "*Start-up procedure*", as described on page 30.

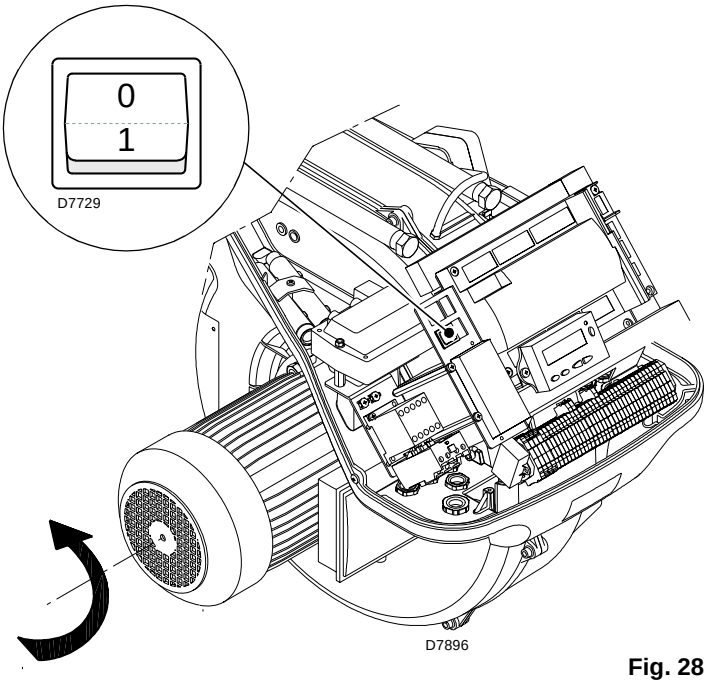


Fig. 28

5.4 Final calibration of the pressure switches

Air pressure switch
Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 29).

With the burner working at MIN output, insert a combustion analyser in the stack, slowly close the suction inlet of the fan (for example, with a piece of cardboard) until the CO value does not exceed 100 ppm.
Slowly turn the appropriate knob clockwise until the burner goes into lockout.
Check the indication of the arrow pointing upwards on the graduated scale (Fig. 29). Turn the knob clockwise again, until the value shown on the graduated scale corresponds with the arrow pointing downwards, and so recovering the hysteresis of the pressure switch (shown by the white mark on a blue background, between the two arrows).
Now check the correct start-up of the burner.
If the burner locks out again, turn the knob slightly anticlockwise.

During these operations it may be useful to measure the air pressure with a pressure gauge.
The connection of the pressure gauge is shown in Fig. 29.
The standard configuration is that with the air pressure switch connected in absolute mode. Note the presence of a "T" connection, not supplied.
In certain applications in strong depression situations, the connection of the pressure switch does not allow it to change over. In this case it is necessary to connect the pressure switch in differential mode, applying a second tube between the air pressure switch and the fan suction line mouth. In this case also, the pressure gauge must be connected in differential mode, as shown in Fig. 29.

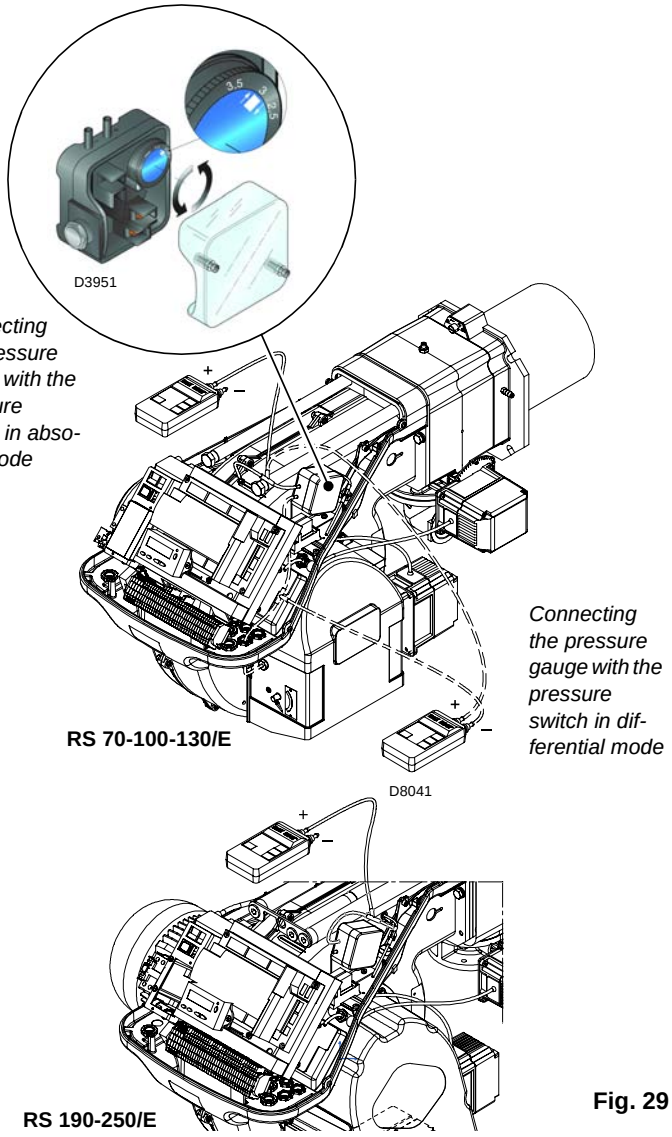

D3951
Connecting the pressure gauge with the pressure switch in absolute mode
RS 70-100-130/E
D8041
Connecting the pressure gauge with the pressure switch in differential mode
RS 190-250/E

Fig. 29

Maximum gas pressure switch

Adjust the maximum gas pressure switch after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale (Fig. 30).

With the burner operating at maximum output, reduce adjustment pressure by slowly turning the relative knob anticlockwise until the burner locks out.

Turn the knob clockwise by 2 mbar and repeat the start-up of the burner.

If the burner locks out again, turn the knob clockwise again by 1 mbar.

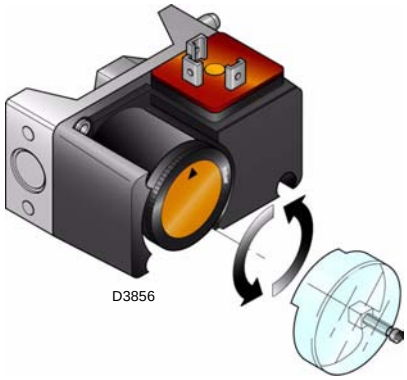


Fig. 30

Minimum gas pressure switch

Adjust the minimum gas pressure switch after having performed all other burner adjustments with the pressure switch set to the start of the scale (Fig. 31).

With the burner operating at maximum output, increase adjustment pressure by slowly turning the relative knob clockwise until the burner locks out.

Then turn the knob anticlockwise by 2 mbar and repeat the burner start-up to ensure it is regular.

If the burner locks out again, turn the knob anticlockwise again by 1 mbar.

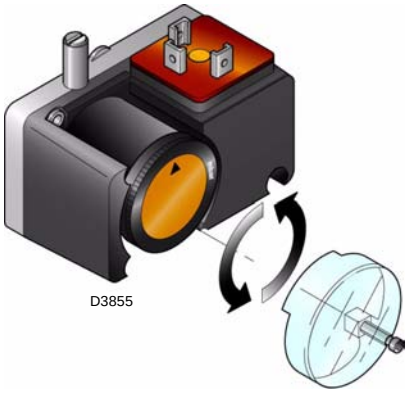


Fig. 31

5.5 Operator panel with LCD display

Description of the symbols

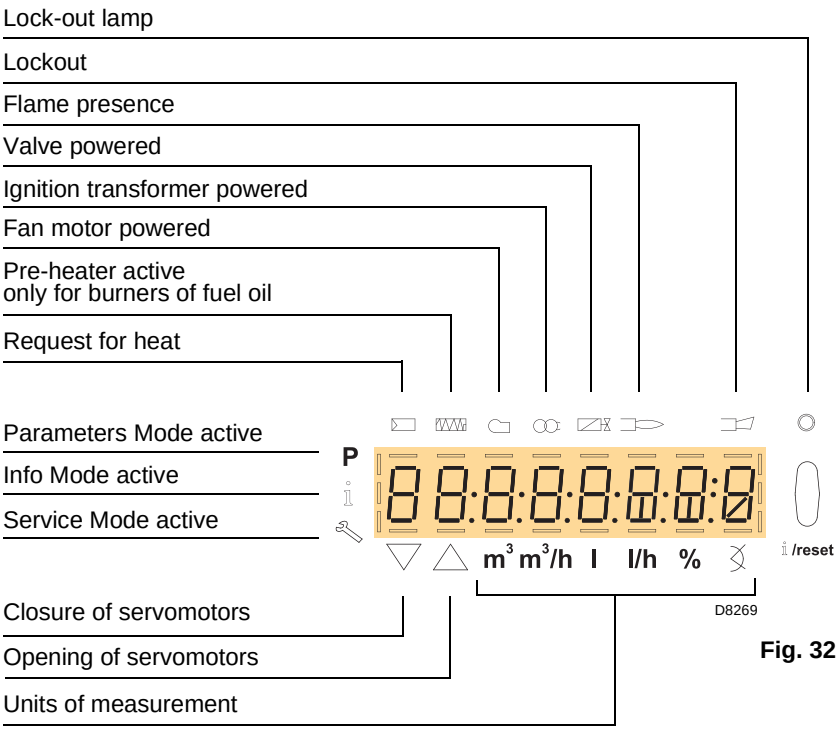


Fig. 32

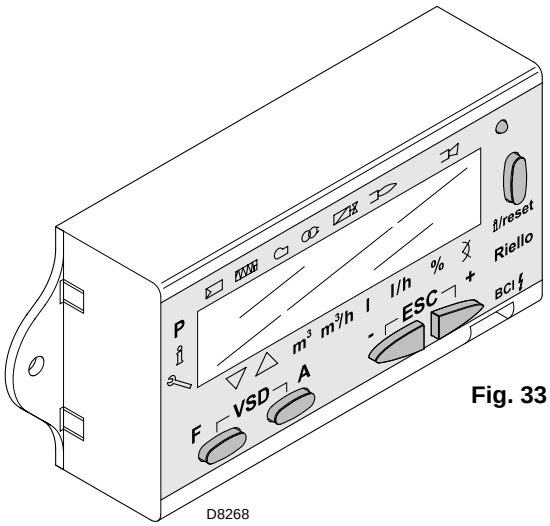


Fig. 33

Key to units of measurement

m^3	cubic metre
m^3/h	cubic metre/hour
l	litre
l/h	litre/hour
%	size as percentage
	degree of opening of servomotors

The unit of measurement of the size visualised is identified by the presence of a dash in the corresponding unit of measurement.

Description of the keys

Key	Function
F	- Adjustment of the fuel servomotor (keep F pressed and adjust the value by pressing - or +)
A	- Adjustment of the air servomotor (keep A pressed and adjust the value by pressing - or +)
VSD **F** **A**	- Access to Parameters Mode **P** (press, at the same time, F and A plus - or +)
i /reset D8273	- **Enter** Parameters Mode - **Reset** in the event of a lockout - Access to a lower level of the menu - In Service Mode and Info Mode, allows: * the selection of the parameter (flashing symbol) (press the key for <1 s) * access to a lower level of the menu (press the key for 1 - 3 s) * access to a higher level of the menu (press the key for 3 - 8 s) * access to another Mode (press the key for > 8 s)
-	- Reduction of value - Access to a lower point of the modulation curve - Scrolling of the parameters list
+	- Increase of value - Access to a higher point of the modulation curve - Scrolling of the parameters list
ESC **-** **+**	**Exit function (ESC)** (press - and + simultaneously) - Non confirmation of the value - Access to a higher level of the menu

5.6 Visualisation and programming modes

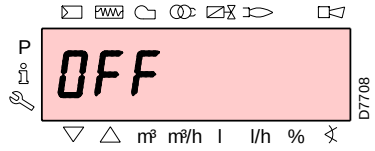
The Operator Panel, and especially the display visualisation, has 4 working modes:

- ➤ Normal mode
- ➤ Info Mode (**InFo**)
- ➤ Service Mode (**Ser**)
- ➤ Parameters Mode (**PArA**)

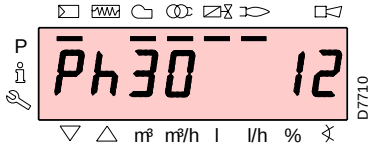
The information for accessing and operating at the various levels is given below.

Normal Mode

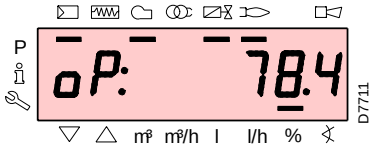
Visualises the operation conditions and allows you to modify the operation point of the burner manually.
It does not require any use of the keys of the Operator Panel.
It allows access to the other visualisation and programming modes.
Some examples in the standard conditions are given below.



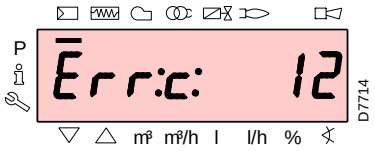
The burner is in the request for heat waiting mode, or the selector “0-1” of Fig. 28 is at the “0” position.

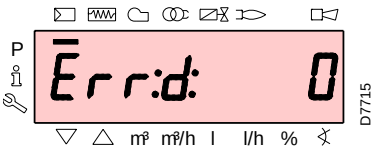


The display visualises the various phases of the start-up, ignition and switch-off of the burner.
In the example alongside, the display indicates that the burner is in phase 30 (see the diagram of Fig. 34) and there are 12 s until the next phase.

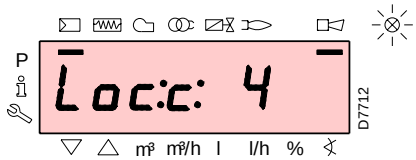


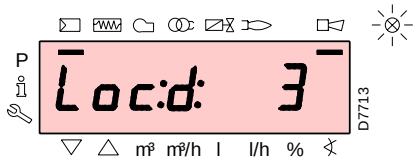
The burner is working in the requested load position (in the example alongside, **78.4%**).



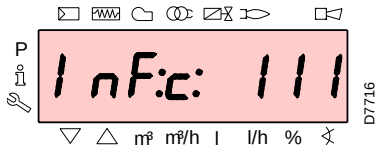


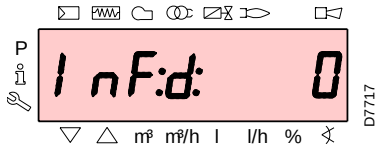
The display visualises alternately the error code (in the example alongside, **c: 12**) and the relative diagnostic (in the example **d: 0**).
The system goes into safety mode and the message shown in the next figure appears.





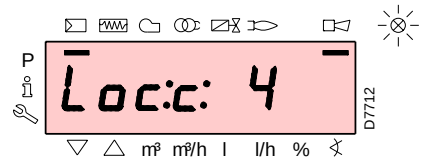
The burner goes into lockout.
The display visualises alternately the lockout code (in the example alongside **c: 4**) and the relative diagnostic (in the example **d: 3**).
The red lock-out lamp is on.

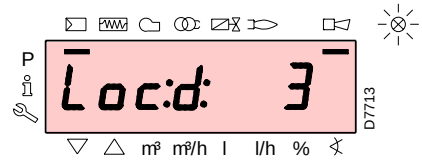




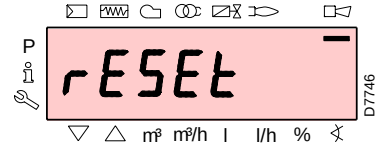
The display visualises alternately an error code and a diagnostic, which does not take the system into safety mode.

Reset procedure





The burner is in lockout when the red indicator light on the Operator Panel is switched on and the display visualises alternately the lockout code (in the example alongside **c: 4**) and the relative diagnostic (in the example **d: 3**).



To reset, press the **"i/reset"** key for 1s: the display will show **"rESEt"**.
When the key is released, the lockout signal will disappear and the red indicator light will switch off.
The control box is reset.

Manual lockout procedure

If necessary, it is possible to manually block the control box and, consequently, the burner, by pressing the key **"i/reset"** simultaneously with any other key of the Operator Panel.

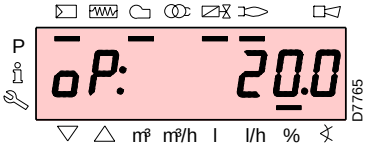
CAUTION

With the switch 1-0 in Fig. 28 the burner does not stop immediately, but the switch-off phase is activated.

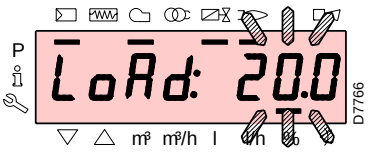
Manual operation procedure

After the adjustment of the burner and the setting of the points on the modulation curve, it is possible to manually check the operation of the burner along the entire curve.

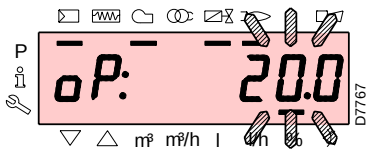
Example



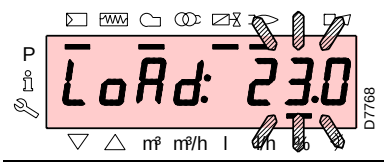
The burner is working at the requested load percentage: 20%.



Press the key **"F"** for 1 second: **"LoAd"** is displayed and the load percentage flashes.



Releasing the key **"F",** the standard visualisation appears, with the current load percentage flashing: this means that the burner is working in manual mode (any outside adjustment is excluded and only the safety devices are active).



Keep the key **"F"** pressed and, with the keys **"+"** or **"–"**, increase or decrease the load percentage.

To emerge from Manual mode, press simultaneously the keys **"+"** and **"-"** (**esc**) for 3 seconds: the burner will work in automatic mode and the output will depend on the thermostat/adjustment pressure switch (TR).

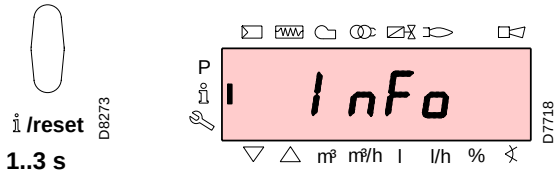
From Normal Mode, using the keys of the Operator Panel, it is possible to activate one of the three visualisation/programming modes:

Visualisation modes
- **1** Info Mode (**InFo**)
- **2** Service Mode **(Ser)**

Programming modes
- **3** Service Mode **(Ser)**

Info Mode

Visualises the general system information.
The list of the parameters that can be visualised is given in the table below.
To access this level, press the key **"i/reset"** for 1 - 3 s.
Release the key immediately when the display shows **"Info"**.

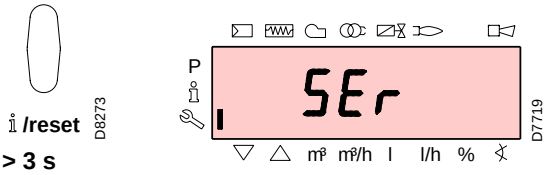


List of the parameters that can be visualised (in the sequence in which they are visualised)

167	Volumetric delivery of fuel in the unit of measurement selected
162	Operation time with flame
163	Operation time
164	No. of resettable ignitions
166	Total no. of ignitions
113	Identification code of the burner
107	Software version
102	Control box test date
103	Identification code of the control box
104	Identification number of the group of parameters set
105	Version of the group of parameters
143	Reserved
End	

Service Mode

Visualises the log of errors and some technical information regarding the system.
The list of the parameters that can be visualised is given in the table below.
To access this level, press the **"i/reset"** key for more than 3 s.
Release the key immediately when the display shows **"SEr"**.



List of the parameters that can be visualised (in the sequence in which they are visualised)

954	Flame intensity (%)
121	Manual setting of output Not defined = automatic operation
922	Position of the servomotors (expressed in degrees, symbol °) 0 = fuel 1 = air
161	Number of errors
701 . . . **725**	Log of the errors: 701-725.01, Code

Operating procedure in Info and Service Modes

After access to these levels, the display visualises the number of the parameter (flashing) on the left, and the corresponding value on the right.

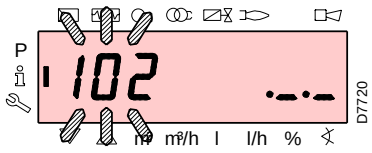
If the value is not visualised, press the key **"i/reset"** for 1 - 3 s.

To return to the Parameters List, press the key **"i/reset"** for more than 3 s, or press simultaneously the keys **"+"** and **"-"** (esc).

To move on to the next parameter, press the key **"+"** or **"i/reset"** for less than 1 s. At the end of the list, the display visualises **"End"**.

To move back to the previous parameter, press the key **"-"**.

To return to the Normal/Standard Visualisation Mode, press the **"i/reset"** key for more than 3 s, or press simultaneously keys **"+"** and **"-"** (esc). For a moment the display will show **"OPErAte"**.



Parameters Mode

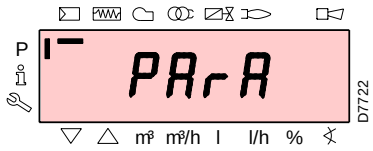
Visualises and allows you to modify/program the complete list of parameters, shown in the table on page 34.
The factory-set parameters are not visible.

The parameters level is subdivided into groups:

100: ParA	**General parameters** Information and identification data of the system.
200: ParA	**Checks on the Burner** Type of operation, intervention and safety times of the various phases.
400: Set	**Air/Fuel modulation curve** Setting of Air/Fuel adjustment points
500: ParA	**Positioning of Servomotors** Choice of positions of the air/fuel servomotors in the various phases.
600: ParA	**Servomotors** Setting and addressing of the servomotors.
700: HISt	**Log of the errors** Choice of different visualisation modes for the errors log.
900: dAtA	**Process information** Visualisation of information for the remote management of the burner.

To access this level, refer to "*Access procedure with password*".

Once the access procedure has been carried out, the display will show **"PArA"** for a few seconds.



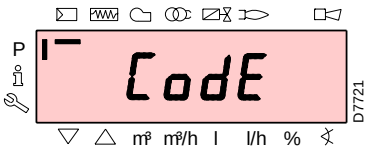
Select the group of parameters with keys **"+"** and **"-"**, and confirm by pressing the **"i/reset"** key.
Within the group you have chosen, scroll through the list with the keys **"+"** and **"-"**. At the end of the list, the display visualises **"End"**.
To return to Normal visualisation mode, simultaneously press the keys **"+"** and **"-"** (esc) twice.

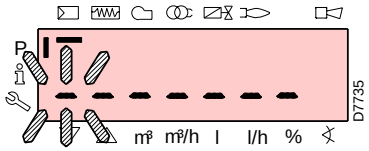
To modify a parameter, refer to "*Parameter modification procedure*".

DANGER

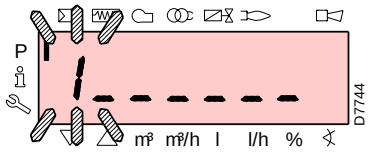
All the parameters are checked in the factory. Modification/tampering may compromise the good operation of the burner and cause injury to people or damage to things. In any case, modifications must be carried out by qualified personnel.

Access procedure with password

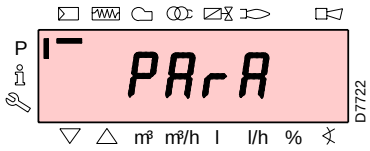


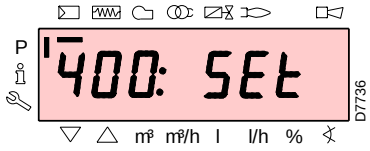


Press the keys **"F"** and **"A"** simultaneously for 1s: for a moment the display will show **"CodE"**, and immediately after you will see 7 dashes, the first one flashing.

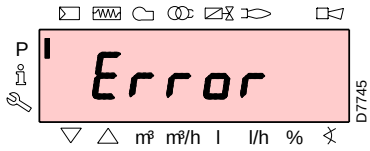


With the keys **"+"** and **"–"** select the first character of the password (letter or number), and confirm by pressing the key **"i/reset"**.





Once you have confirmed, the sign **"–"** will appear.
Continue in the same way for the other characters.
After inserting the last character of the password, confirm by pressing the key **"i/reset"**: if the password inserted is correct you will see **"PArA"** for a few seconds, then you can access the various groups of parameters.
With the keys **"+"** and **"–"** select the group you require.

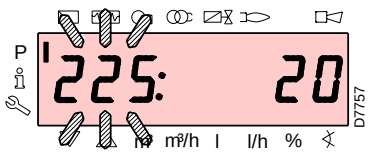


If the password inserted is incorrect, the message **"Error"** will appear for a moment.
It is then necessary to repeat the procedure.

DANGER

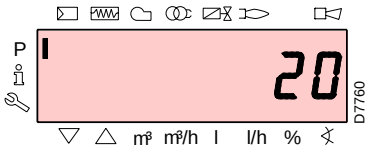
The password must only be communicated to the qualified personnel or the Technical Assistance Service, and must be kept in a safe place.

Parameter modification procedure



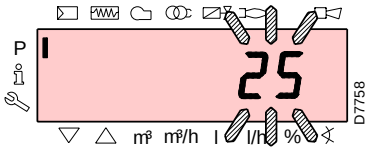
After accessing the level and group of parameters, the display visualises the number of the parameter (flashing) on the left, and the corresponding value on the right.
If the value is not visualised, press the key **"i/reset"** for 1 - 3 s.

Find below an example of how to modify the parameter relating to the **pre-purging time** (No. 225).

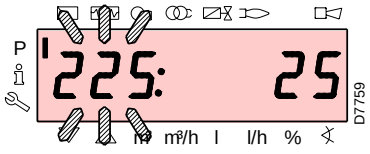


Press the key **"i/reset"**: the value **20** (seconds) will appear.

Note: the unit of measurement of the time is not visualised but is understood in seconds.



Press the key **"+"** and increase the value to **25** seconds (flashing).
Press the key **"i/reset"** to confirm and store.



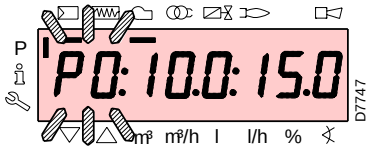
To return to the list of parameters, press simultaneously the keys **"+"** and **"-"** (esc).

Procedure for inserting and adjusting points on the modulation curve

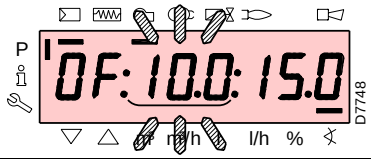
Nine adjustment/calibration points (P1 - P9) can be inserted in the control box for each servomotor, varying their position by degrees and, consequently, the quantity of air and fuel introduced.
The **ignition point P0** is independent of the minimum modulation value. This means that, in the event of difficulty, it is possible to switch on the burner at a value other than the modulation minimum (P1).

To insert or adjust a point, proceed as follows:

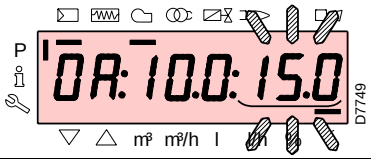
Access the Parameters level (group 400) referring to "*Access procedure with password*".



Using the keys **"+"** and **"-"** insert/select the curve point you want and wait for it to flash: this means that the servomotors are now positioned on the values shown on the display and which correspond to the point previously set.
It is now possible to insert/modify the position by degrees.
Warning: the set value does not require confirmation.



For the fuel servomotor, keep the key **"F"** pressed (the position in degrees flashes) and press the keys **"+"** or **"-"** to increase or decrease the value.



For the air servomotor, keep the key **"A"** pressed (the position in degrees flashes) and press the keys **"+"** or **"-"** to increase or decrease the value.

Select another point, or exit this area by pressing the keys **"+"** and **"-"** simultaneously (esc).

5.7 Operation sequence of the burner

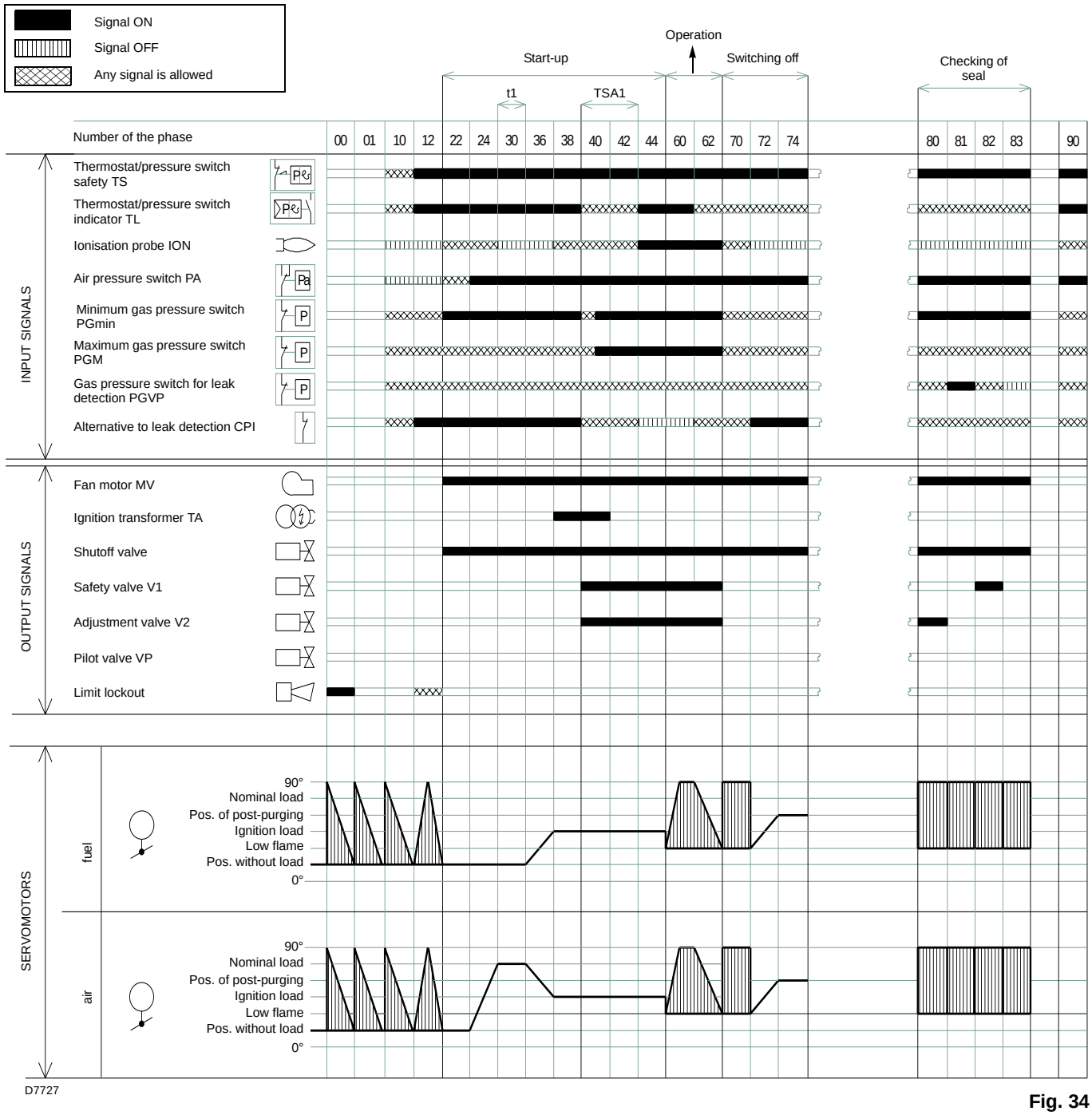


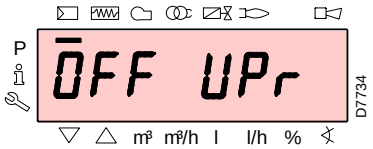
Fig. 34

List of the phases

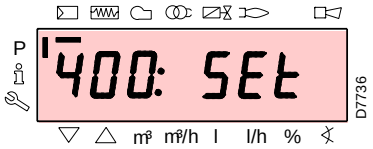
Ph00	Lockout phase
Ph01	Safety phase
Ph10	t10 = closure in pause
Ph12	Standby
Ph22	t22 = Uphill train of the fan motor (fan motor = ON, safety valve = ON)
Ph24	The burner moves to the pre-purging position
Ph30	t1 = pre-purging time
Ph36	The burner moves to the ignition position
Ph38	t3 = pre-ignition time
Ph40	TSA1 = safety time 1 (ignition transformer ON)
Ph42	TSA1 = safety time 1 (ignition transformer OFF), t42 = pre-ignition time OFF
Ph44	t44 = interval time 1
Ph60	Operation
Ph62	t62 = max. time to reach the low flame (the burner moves to the switch-off position)
Ph70	t13 = post-combustion time
Ph72	The burner moves to the post-purging position
Ph74	t8 = post-purging time
Ph80	t80 = emptying time (valve leak detection)
Ph81	t81 = atmospheric test time (valve leak detection)
Ph82	t82 = filling time (valve leak detection)
Ph83	t83 = pressure test time (valve leak detection)
Ph90	Standby time due to lack of gas

Ph = Phase

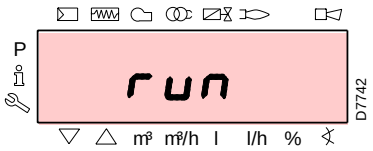
5.8 Start-up procedure



Check that the display of the Operator Panel shows request for heat and **"OFF Upr"**: this means it is necessary to set the modulation curve of the burner.



Access the Parameters Level referring to "*Access procedure with password*".
The display visualises the parameters group **400;** confirm with the key **"i/reset"**.



The display visualises **"run"**.

Confirm with the key **"i/reset"**: the burner **starts up.**

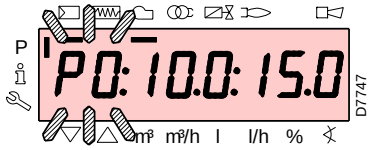
The display visualises in sequence all the various phases and relative times.
The phases are those defined on page 29.
Phase 22:
Start of the fan motor.
As the burner is not fitted with a device to check the sequence of the phases, the motor rotation may be incorrect. As soon as the burner starts up, go in front of the cooling fan of the fan motor and check it is rotating anticlockwise. See Fig. 28.
If this is not the case:

- ➤ place the switch of Fig. 28 in position **"0"** and wait for the control box to carry out the switch-off phase;
- ➤ **disconnect the electrical supply from the burner;**
- ➤ invert the phases on the three-phase power supply.

DANGER

This operation must be carried out with the electrical supply disconnected.

Phase 24:
The burner goes to the pre-purging position, the air servomotor opens the damper at 90°.
Phases 80, 81, 82, 83:
These phases relate to the valve seal test (for the burner RS68/E this function is not inserted in the factory, as it is optional).
Phase 30:
The count of the pre-purging time pre-set in the factory begins.

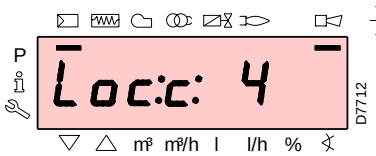


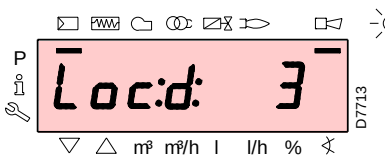
Phase 36:
The burner goes to the ignition position, point **"P0"**, defined in the table on page 31: the display visualises the indication **"P0"** flashing. If the value proposed is suitable, confirm. Otherwise, modify the ignition point (see "*Procedure for inserting and adjusting points on the modulation curve*").

DANGER

Warning: the values shown in the figure alongside are purely for indication purposes.

Confirm with the key **"+".**





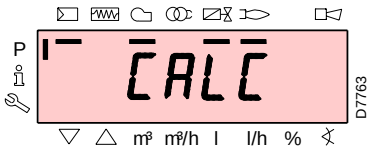
Phase 38:
The ignition phase begins and the spark goes off.
Phase 40:
The gas valves open (the count of the safety time begins).
Check the presence of the flame from the special inspection window, and the correctness of the combustion parameters; if necessary, vary the degrees of opening/closing of the air and fuel servomotors.
If the control box goes into lockout, press the keys **"+"** and **"-"** (esc) simultaneously: the display visualises alternately the lockout code for flame absence (**c: 4**) and the relative diagnostic (**d: 3**).
Resolve the problem, referring to Ch. 5.12.

Reset (see "*Reset procedure*"): the display visualises **"OFF Upr"**.

Repeat the start-up procedure.

Warning: the values inserted previously remain stored.

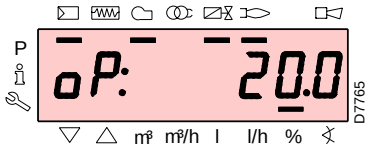
After ignition (point **"P0"**), proceed with the calibration of the modulation curve, starting from the minimum point **"P1"**.
Press the key **"+"**: the display visualises the indication **"P1"** flashing and proposes the same settings as for point **"P0"**. It is possible to modify this value and obtain a modulation minimum different from the ignition point.



After adjusting point "P1", press the key **"+":** the display shows **"CALC"** for a few seconds. The control box will automatically calculate the points from "P2" to "P8", distributing them in a straight line, assuming for point "P9" the factory setting (see the table below). These are theoretical and must be checked.
Press the key **"+"** to check if the settings of point "P2" are suitable. If not, modify the point. Proceed in sequence until point "P9".

WARNING

Important: before moving on from one point to the next, wait for the servomotors to reach the position visualised on the display.



During the adjustment of each point, work on the air and gas servomotors, without modifying the position of the gas valve stabiliser.
Halfway through the procedure (i.e. around point P4 or P5), you are advised to measure gas delivery and check that the output is about 50% of the maximum output. If this is not the case, work also on the gas valve stabiliser: in this case however, it is necessary to revise the calibrations of all the points previously set.
Once you have arrived at point "P9", if the maximum output is not as you wish, work on the gas valve stabiliser: in this case however, it is necessary to revise the calibrations of all the points previously set.
At this point, confirm by pressing simultaneously the keys **"+"** and **"-"** (**esc**): the parameter **"546"** will appear.
If you want to make the burner work on the entire modulation curve, press simultaneously the keys **"+"** and **"-"** (**esc**): in this way, the parameter **"546"** will automatically be assigned the value of **100%** and the parameter **"545"** will have a value of **20%**.
If you want to make the burner work on a part of the modulation curve, modify the parameters **"546"** and **"545"** according to "*Parameter modification procedure*".

Press simultaneously the keys **"+"** and **"-"** (**esc**) twice: the display will visualise the current load position.

Factory settings

Point of the curve		Burner				
		RS 70/E MZ	RS 100/E MZ	RS 130/E MZ	RS 190/E	RS 250/E MZ
P0	air	20°	20°	20°	20°	20°
	gas	24°	24°	24°	24°	24°
P9	air	90°	90°	90°	90°	90°
	gas	90°	90°	90°	90°	90°

5.9 CALC function

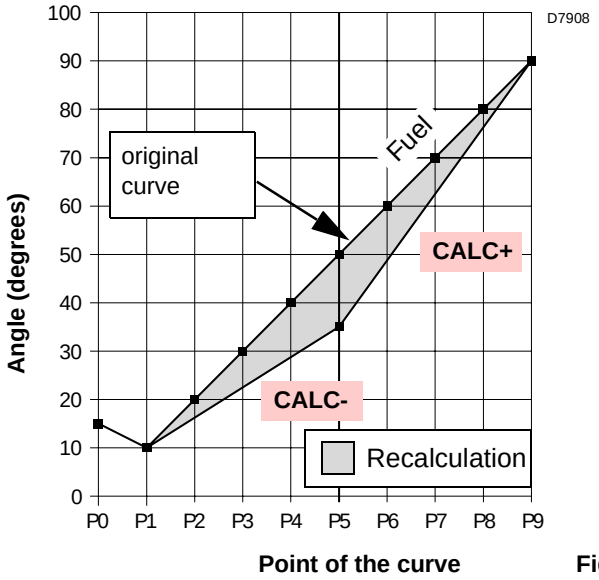


Fig. 35

The diagram of Fig. 35 shows how the fuel modulation curve is modified if the values of point “P5” are changed.
By keeping the key **“+”** pressed for more than 3 s, the points from “P6” to “P8” are recalculated.
By keeping the key **“-”** pressed for more than 3 s, the points from “P4” to “P2” are recalculated.

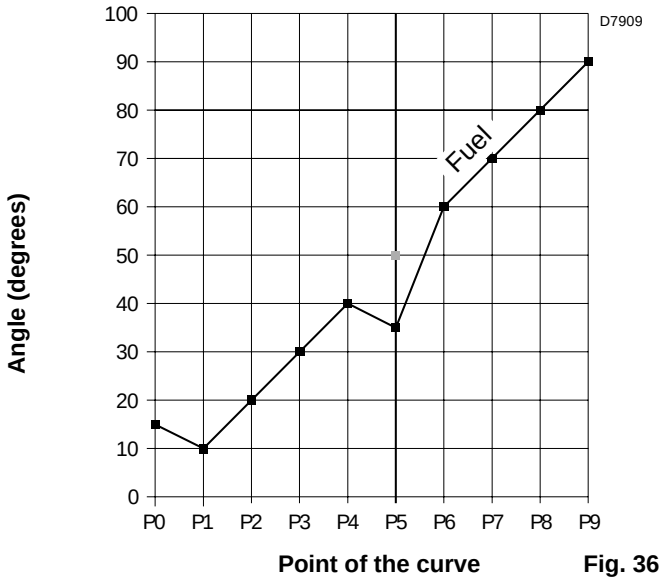


Fig. 36

The diagram of Fig. 36 shows the fuel modulation curve when, after the modification of point “P5”, the recalculation of all the other points is not carried out.

5.10 Burner adjustment

Output upon ignition

According to the regulation EN 676.

Burners with MAX output up to 120 kW
Ignition can be performed at the maximum operation output level. Example:
- ➤ max. operation output: 120 kW
- ➤ max. output upon ignition: 120 kW

Burners with MAX output above 120 kW
Ignition must be performed at a lower output than the max. operation output.
If ignition output does not exceed 120 kW, no calculations are required. If ignition output exceeds 120 kW, the regulations prescribe that the value be defined according to the control box safety time "ts":
for ts = 3s, ignition output must be equal to, or lower than, 1/3 of max. operation output.

Example
MAX operation output of 450 kW.
The ignition output must be equal to, or less than, 150 kW with ts = 3 s

In order to measure the ignition output:
- ➤ disconnect the plug-socket 7)(Fig. 5) on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed);
- ➤ perform 10 ignitions with consecutive lockouts;
- ➤ on the meter, read the quantity of gas burned:
  this quantity must be equal to, or lower than, the quantity given by the formula, for ts = 3s:

$$Vg = \frac{\textbf{Qa} \text{ (max. burner delivery) } \textbf{x n x ts}}{\textbf{3600}}$$

Vg: volume supplied in ignitions carried out (Sm^3)
Qa: ignition delivery (Sm^3/h)
n: number of ignitions (10)
ts: safety time (sec)

Example for gas G 20 (9.45 kWh/Sm^3):
ignition output 150 kW
corresponding to 15.87 Sm^3/h.
After 10 ignitions with lockout, the delivery indicated on the meter must be equal to, or less than:

$$Vg = \frac{\textbf{15.87 x 10 x 3}}{\textbf{3600}} = \textbf{0.132 Sm}^3$$

Maximum output

The MAX output must be set within the firing rate of Fig. 3.

Gas adjustment
Measure the gas delivery on the meter.
As a general rule, this value can be found on the table on page 52: just read the gas pressure on the pressure gauge (Fig. 38) and follow the indications given on page 52.
- ➤ If it is necessary to reduce it, lower the output gas pressure via the pressure adjuster located beneath the gas valve.
- ➤ If it needs to be increased, increase the output gas pressure via the adjuster.

Note
Check that the combustion is satisfactory and without pulsations.

Air adjustment
If necessary vary the degrees of the air servomotor.

Minimum output

The MIN output must be set within the firing rate of Fig. 3.

5.11 Steady state operation

Burner without modulating operation kit
Once the start-up cycle is completed, the servomotor command moves on to the thermostat/pressure switch TR that controls the pressure or the temperature in the boiler.

- ➤ If the temperature or the pressure is low (so the thermostat/pressure switch TR is closed), the burner progressively increases the output as far as the MAX value (point “P9”).
- ➤ If the temperature or the pressure increases as far as the opening of the thermostat/pressure switch TR, the burner progressively reduces the output as far as the MIN value (point “P1”). And so on.
- ➤ The burner switches off when the request for heat is lower than the heat supplied by the burner at MIN output. The thermostat/pressure switch TL opens and the control box carries out the switching off phase (see Ch. 5.7). The damper closes completely to reduce thermal dispersions to a minimum.

Burner with modulating operation kit
See the manual supplied with the regulator.

5.12 Ignition failure

If the burner does not switch on, there is a lockout within 3 s of the electrical supply reaching the gas valve.
It may be that the gas does not arrive at the combustion head within the safety time of 3 s.
In this case, increase gas delivery upon ignition.
The arrival of the gas at the pipe coupling is shown on the pressure gauge of Fig. 38.

5.13 Burner flame goes out during operation

If the flame accidentally goes out during operation, the control box carries out a recycle (i.e. it repeats the start-up phase once, and makes a further ignition attempt).
If the flame is still absent, the control box goes into lockout.

5.14 Stopping of the burner

The burner can be stopped by:

- ➤ intervening on the disconnecting switch of the electrical supply line, located on the boiler panel;
- ➤ removing the hood and working on the switch 0-1 of Fig. 28;
- ➤ removing the transparent protection that covers the Operator Panel, after loosening the relative screw, and using the Panel itself according to *“Manual lockout procedure*”.

5.15 Measuring the ionisation current

The burner is fitted with an ionisation system to check that a flame is present.
The minimum current for control box operation is 4 µA. The Operator Panel visualises “30%” (see Parameters List, parameter no. 954).
The burner provides a much higher current, so controls are not normally required. However, if it is necessary to measure the ionisation current, disconnect the plug-socket Ap.37 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 µA - see Fig. 37.
Carefully check the polarities!

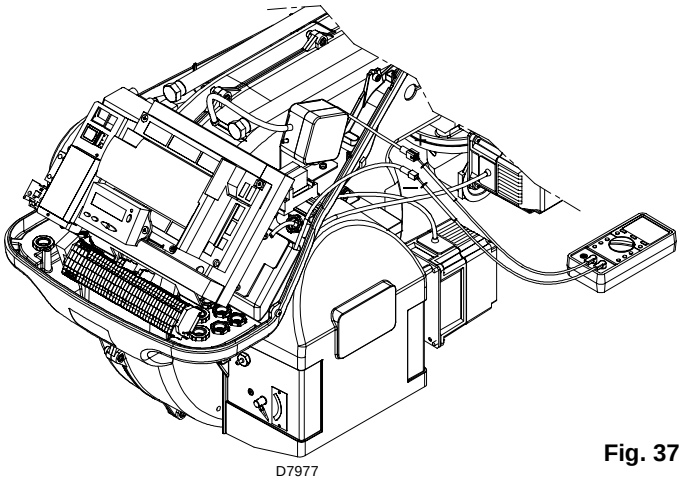


Fig. 37

5.16 Checking the air and gas pressure on the combustion head

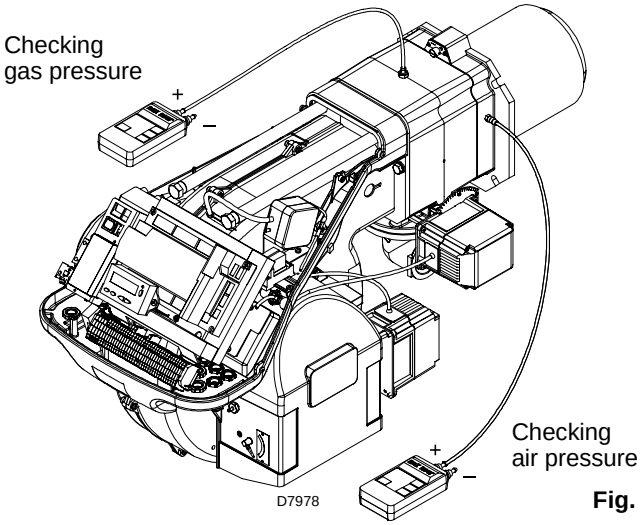


Fig. 38

5.17 Final checks (with the burner working)

- ➤ Open the thermostat/pressure switch TL:
- ➤ Open the thermostat/pressure switch TS:

<u>the burner must stop</u>

- ➤ Rotate the maximum gas pressure switch knob to the minimum end-of-scale position.
- ➤ Rotate the air pressure switch knob to the maximum end-of-scale position.

<u>the burner must stop in lockout</u>

- ➤ Switch off the burner and disconnect the voltage.
- ➤ Disconnect the minimum gas pressure switch connector.

<u>the burner must not start</u>

- ➤ Disconnect the ionisation probe wire.

<u>the burner must stop in lockout due to firing failure</u>

- ➤ Make sure that the mechanical locking systems on the different adjustment devices are fully tightened.

5.18 List of parameters

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
100	**General parameters**								
102	Control box identification date	1	-	Reading only	0	255	1		Info Mode
103	Control box identification number	1	-	Reading only	0	65535	1		Info Mode
104	Identification number of the group of parameters set	1	-	Reading only	0	255	1		Info Mode
105	Version of the group of parameters set	1	-	Reading only	0	0xFFFF	1		Info Mode
107	Software version	1	-	Reading only	0	0xFFFF	1		Info Mode
113	Burner identification	1	-	Modification	0	99999999	1	Not defined	Info Mode
121	Manual setting of output Not defined = automatic operation	1	-	Modification / zero setting	0 %	100 %	0.1 %	Not defined	Service Mode
125	Frequency of main power supply 0 = 50 Hz 1 = 60 Hz	1	-	Modification	0	1	1	0	Parameters Mode
126	Brightness of display	1	-	Modification	0 %	100 %	1 %	75 %	Parameters Mode
128	Fuel meter: Led pulse valence (led pulses / volumetric flow units)	1	-	Modification	0	400	0.01	0	Parameters Mode
130	Eliminate visualisation error chronology To eliminate the visualisation, set the parameter to 1, then to 2 Answer 0: Process successful Answer -1: Time-out of 1_2 - Sequence	1	-	Modification	-5	2	1	0	Parameters Mode
141	Remote management of control box 0 = off 1 = Modbus 2 = reserved		-	Modification	0	2	1	0	Parameters Mode
142	Standby time before a new attempt in event of fault in communication		s	Modification	0 s	7200 s	1 s	600 s	Parameters Mode
143	Reserved		-	Modification	1	8	1	1	Info Mode
144	Reserved		-	Modification	10 s	60 s	1 s	30 s	Parameters Mode
145	Peripheral address for Modbus		-	Modification	1	247	1	1	Parameters Mode
146	Baud Rate for Modbus 0 = 9600 1 = 19200		-	Modification	0	1	1	0	Parameters Mode
147	Parity for Modbus 0 = none 1 = odd 2 = even	1	-	Modification	0	2	1	0	Parameters Mode

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
148	Selection of the burner operation during the interruption of the switch-over with the system of remote management. 0 = burner switched off With **modulating operation** the settings of the values are the following: 0...19.9 = burner switched off 20...100 = 20...100% burner modulation field (20% = low flame) These settings adapt to parameters 545 (modulation minimum) and 546 (modulation maximum) With **stage operation**: 0 = burner switched off, 1st, 2nd, 3rd stage according to the values assigned to P1, P2, P3 No setting = no function in the event of communication interruption	1		Modification / zero setting	0 %	100 %	0.1 %	Not defined	Parameters Mode
161	Total number of errors	1	-	Reading only	0	65535	1	0	Service Mode
162	Hours of operation (that can be reset)	1	h	Reset	0 h	999999h	1 h	0 h	Info Mode
163	Total hours of power supply to control box	1	h	Reading only	0 h	999999h	1 h	0 h	Info Mode
164	Total number of start-ups (that can be reset)	1	-	Reset	0	999999	1	0	Info Mode
166	Total number of start-ups	1	-	Reading only	0	999999	1	0	Info Mode
167	Volumetric delivery of fuel in the selected unit of measurement (that can be reset)	1	-	Reset	0	99999999	1	0	Info Mode
200	**Checks on the burner**								
201	Burner operation mode (fuel supply line, modulating/stage, servomotors, etc.) -- = not defined (eliminate curves) 1 = Gmod 2 = Gp1 mod 3 = Gp2 mod 4 = Lo mod 5 = Lo 2 stages 6 = Lo 3 stages 7 = Gmod pneu 8 = Gp1 mod pneu 9 = Gp2 mod pneu	1	-	Modification / zero setting	1	9	1	Not defined	Parameters Mode
208	Stopping of the program 0 = deactivated 1 = Pre-purging (Ph24) 2 = Ignition (Ph36) 3 = Interval 1 (Ph44) 4 = Interval 2 (Ph52)	1	-	Modification	0	4	1	0	Parameters Mode
210	Alarm/lockout at start	1	-	Modification	0	1	1	0	Parameters Mode
211	Uphill train fan motor	1	s	Modification	2 s	60 s	0.2 s	2 s	Parameters Mode
212	Maximum time to reach low flame	1	s	Modification	0.2 s	10 min	0.2 s	45 s	Parameters Mode
215	Maximum repeats of safety circuit	1	-	Modification	1	16	1	16	Parameters Mode

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
221	Gas: Selection of flame sensor 0 = QRB.../ QRC 1 = ION / QRA	1	-	Modification	0	1	1	1	Parameters Mode
222	Gas: Selection of the pre-purging function 0 = deactivated 1 = activated	1	-	Modification	0	1	1	1	Parameters Mode
223	Maximum repeats of minimum gas pressure switch intervention	1	-	Modification	1	16	1	16	Parameters Mode
225	Gas: Pre-purging time	1	s	Modification	20 s	60 min	0.2 s	20 s	Parameters Mode
226	Gas: Pre-ignition time	1	s	Modification	0.2 s	60 min	0.2 s	2 s	Parameters Mode
230	Gas: Interval 1	1	s	Modification	0.2 s	60 s	0.2 s	2 s	Parameters Mode
232	Gas: Interval 2	1	s	Modification	0.2 s	60 s	0.2 s	2 s	Parameters Mode
233	Gas: Post-combustion time	1	s	Modification	0.2 s	60 s	0.2 s	8 s	Parameters Mode
234	Gas: Post-purging time	1	s	Modification	0.2 s	108 min	0.2 s	0.2 s	Parameters Mode
242	Gas: Emptying time (valve leak detection)	1	s	Modification	0.2 s	3 s	0.2 s	3 s	Parameters Mode
243	Gas: Atmospheric test time (valve leak detection)	1	s	Modification	0.2 s	60 s	0.2 s	10 s	Parameters Mode
244	Gas: Filling time (valve leak detection)	1	s	Modification	0.2 s	3 s	0.2 s	3 s	Parameters Mode
245	Gas: Pressure test time (valve leak detection)	1	s	Modification	0.2 s	60 s	0.2 s	10 s	Parameters Mode
261	Oil: Selection of flame sensor 0 = QRB.../ QRC... 1 = ION / QRA	1	-	Modification	0	1	1	0	Parameters Mode
265	Oil: Pre-purging time	1	s	Modification	15 s	60 min	0.2 s	15 s	Parameters Mode
266	Oil: Pre-ignition time	1	s	Modification	0.2 s	60 min	0.2 s	2 s	Parameters Mode
270	Oil: Interval 1	1	s	Modification	0.2 s	60 min	0.2 s	2 s	Parameters Mode
272	Oil: Interval 2	1	s	Modification	0.2 s	60 min	0.2 s	2 s	Parameters Mode
273	Oil: Post-combustion time	1	s	Modification	0.2 s	60 s	0.2 s	8 s	Parameters Mode
274	Oil: Post-purging time	1	s	Modification	0.2 s	108 min	0.2 s	0.2 s	Parameters Mode
281	Oil: Selection transformer ignition phase TA 0 = brief pre-ignition (Ph38) 1 = long pre-ignition (with fan) (Ph22)	1	-	Modification	0	1	1	0	Parameters Mode
400	**Air / fuel modulation curve**								
401	Checking fuel servomotor	13	(°)	Modification	0°	90°	0.1°	0°; 0°; 15°; not defined	Parameters Mode
402	Checking air servomotor	13	(°)	Modification	0°	90°	0.1°	0°; 90°; 45°; not defined	Parameters Mode
500	**Positioning of servomotors**								
501	Position of the fuel servomotor in absence of flame Index 0 = standby position Index 1 = pre-purging position Index 2 = post-purging position	3	(°)	Modification	0°	90°	0.1°	0°; 0°; 15°	Parameters Mode

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
502	Position of the air servomotor in absence of flame Index 0 = standby position Index 1 = pre-purging position Index 2 = post-purging position	3	(°)	Modification	0°	90°	0.1°	0°; 90°; 45°	Parameters Mode
545	Minimum modulation limit	1	-	Modification / zero setting	20 %	100 %	0.1 %	Not defined	Parameters Mode
546	Maximum modulation limit	1	-	Modification / zero setting	20 %	100 %	0.1 %	Not defined	Parameters Mode
600	**Servomotors**								
645	Analogical exit configuration 0 = CC 0...10 V 1 = CC 2...10 V 2 = CC 0 / 2...10 V	1	-	Modification	0	2	1	0	Parameters Mode
700	**Log of the errors**								
701	Error chronology: 701-725.01.Code	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.02.Diagnostic code	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.03.Error class	25	-	Reading only	0	6	1	0	Service Mode
•	Error chronology: 701-725.04.Phase	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.05.Start-up meter	25	-	Reading only	0	99999999	1	0	Service Mode
725	Error chronology: 701-725.06.Load	25	-	Reading only	0 %	100 %	0.1 %	0 %	Service Mode
900	**Process information**								
903	Current output Index 0 = fuel Index 1 = air	2	-	Reading only	0 %	100 %	0.1 %	0 %	Parameters Mode
910	Servomotors active	3	-	Reading only	0	1	1	0	Parameters Mode
922	Position of the servomotors Index 0 = fuel Index 1 = air	2	(°)	Reading only	-50°	150°	150°	0°	Service Mode
942	Heat source active	1	-	Reading only	0	255	1	0	Parameters Mode
947	Result of the sampling of the contact (codified in bits)	2	-	Reading only	0	255	1	0	Parameters Mode
950	Relay request status (coded in bits)	1	-	Reading only	0	255	1	0	Parameters Mode
954	Flame intensity	1	-	Reading only	0 %	100 %	1 %	0 %	Service Mode
961	Status of external modules and visualisation	1	-	Reading only	0	255	1	0	Parameters Mode
992	Error indicators	10	-	Reset	0	0xFFFFFFFF	1	0	Parameters Mode

If faults arise in ignition or operations, the burner performs a "safety stop", which is signalled by the red burner lockout LED. The display visualises alternately the lockout code and the relative diagnostic.
To reset the start-up conditions, refer to "*Reset procedure*". When the burner starts up again, the red LED goes out.

6.1 List of error codes

Error code	Diagnostic code	Meaning of the system REC27.100A2	Recommended measures
2	**4**	**No flame at the end of TSA1**	
3	#	Air pressure error	
	0	Air pressure switch off	
	1	Air pressure switch on	
	4	Air pressure on – Lockout alarm at start	
4	#	**Extraneous light**	
	0	Extraneous light during start-up	
	1	Extraneous light during switch-off	
	2	Extraneous light during start-up – Lockout alarm at start	
7	**3**	**Loss of flame**	
12	#	**Valve leak detection / CPI**	
	0	V2 leaks / CPI open	Leak test Check if the valve on the side of the burner has any leaks. Check if the pressure switch for the leak test (PGVP) is closed when gas pressure is not present. CPI Check the wiring. Check if the CPI contact is closed.
	1	V1 leaks / CPI closed	Leak test Check if the valve on the side of the gas has any leaks. CPI Check the wiring. Check if the CPI contact opens when the valve is powered.
20	**0**	**Pmin** Min. gas / oil pressure absent	
21	**0**	**Pmax** Max. gas / oil pressure exceeded	
22	**0**	Safety circuit open	
50 - 58	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
60	**0**	**Internal error: No valid load checking device**	Carry out a reset; if the error arises repeatedly, replace the control box
65 - 67	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
70	#	**Fuel / air checking error: Calculation position in modulation**	
	21	Invalid load	No valid load
	26	Curve points not defined	Adjust the curve points of all the actuators
71	#	**Special position not defined**	
	0	Standby position	Set the standby position of all the servomotors used
	1	Post-purging position	Set the post-purging position of all the servomotors used
	2	Pre-purging position	Set the pre-purging position of all the servomotors used
	3	Ignition position	Set the ignition position of all the servomotors used
72	#	**Fuel / air internal checking error**	Carry out a reset; if the error arises repeatedly, replace the control box
73	#	**Fuel / air internal checking error**	
	21	Position calculation, invalid stage load	No valid load
	26	Position calculation, stage curve points not defined	Adjust the curve points of all the servomotors
75	#	**Fuel / air ratio internal checking error**	
	1	Check synchronisation data, different current load	
	2	Check synchronisation data, different target load	
	4	Check synchronisation data, different target positions	
	16	Check synchronisation data, different positions reached	
76	#	**Fuel / air internal checking error**	Carry out a reset; if the error arises repeatedly, replace the control box
84	#	**Servomotors curve slope**	
	Bit 1 Valence 2..3	Fuel servomotor: Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position variation of 31° between 2 points of the modulation curve
	Bit 2 Valence 4..7	Air servomotor: Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position variation of 31° between 2 points of the modulation curve

Error code	Diagnostic code	Meaning of the system REC27.100A2	Recommended measures
85	#	Reference error of a servomotor	
	Bit 0 Valence 1	Reference error of the fuel servomotor	The reference of the fuel servomotor was not successful. It was not possible to reach the reference point. 1. Check if the servomotors have been inverted. 2. Check if the servomotor is blocked or overloaded.
	Bit 1 Valence 2…3	Reference error of the air servomotor	The reference of the air servomotor was not successful. It was not possible to reach the reference point. 1. Check if the servomotors have been inverted. 2. Check if the servomotor is blocked or overloaded.
	Bit 7 Valence ≥ 128	Reference error owing to parameter modification	The parameterization of an actuator (e.g. the reference position) has been modified. This error will be visualised to start up a new reference.
86	#	**Fuel servomotor error**	
	0	Position error	It was not possible to reach the target position within the requested tolerance range. 1. Check if the servomotor is blocked or overloaded.
	Bit 0 Valence 1	Circuit open	Circuit open shown on the servomotor connection. 1. Check the wiring.
	Bit 3 Valence ≥ 8	Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position modification of 31° between 2 points of the modulation curve.
	Bit 4 Valence ≥ 16	Deviation of section compared with the last reference	Overloading of the servomotor or servomotor subjected to mechanical torsion. 1. Check if the servomotor is blocked in any point along its range of action. 2. Check if the torque is sufficient for the application.
87	#	**Air servomotor error**	
	0	Position error	It was not possible to reach the target position within the requested tolerance range. 1. Check if the servomotor is blocked or overloaded.
	Bit 0 Valence 1	Circuit open	Circuit open shown on the servomotor connection. 1. Check the wiring.
	Bit 3 Valence ≥ 8	Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position modification of 31° between 2 points of the modulation curve.
	Bit 4 Valence ≥ 16	Deviation of section compared with the last reference	Overloading of the servomotor or servomotor subjected to mechanical torsion. 1. Check if the servomotor is blocked in any point along its range of action. 2. Check if the torque is sufficient for the application.
90 - 91	#	**Burner internal checking error**	
93	#	**Flame signal acquisition error**	
	3	Short circuit of the sensor	Short circuit in the QRB sensor... 1. Check the wiring. 2. Flame detector probably faulty.
95	#	**Relay supervision error**	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	External power supply - Contact active	Check the wiring.
96	#	**Relay supervision error**	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	The relay contacts have joined together	Check the contacts: 1. Control box connected to the power supply: the fan output must be without voltage. 2. Disconnect the power supply. Disconnect the fan. The resistive connection between the fan output and the neutral wire is not allowed. If one of the 2 tests fails, replace the control box because the contacts are definitively joined together and it is no longer possible to guarantee safety.
97	#	**Relay supervision error**	
	0	The safety relay contacts have joined together or the safety relay has been powered by an external power supply	Check the contacts: 1. Control box connected to the power supply: the fan output must be without voltage. 2. Disconnect the power supply. Disconnect the fan. The resistive connection between the fan output and the neutral wire is not allowed. If one of the 2 tests fails, replace the control box because the contacts are definitively joined together and it is no longer possible to guarantee safety.

Error code	Diagnostic code	Meaning of the system REC27.100A2	Recommended measures
98	**#**	**Relay supervision error**	
	2 Safety valve 3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	The relay does not start up	Carry out a reset; if the error arises repeatedly, replace the unit
99 - 100	**#**	**Relay internal checking error**	Carry out a reset; if the error arises repeatedly, replace the control box
105	**#**	**Contact sampling internal error**	
	0 Min. pressure switch 1 Max. pressure switch 2 Valve operation test pressure switch 3 Air pressure 4 Load controller open 5 Load controller on/ off 6 Load controller closed 7 Safety loop / Burner flange 8 Safety valve 9 Ignition transformer 10 Fuel valve 1 11 Fuel valve 2 12 Fuel valve 3 13 Reset	Blocked upon irregularity	Can be caused by capacitive loads or presence of DC voltage on the main power supply of the control box. The diagnostic code indicates the input in which the problem arose
106 - 108	**#**	**Contact request internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
110	**#**	**Voltage monitoring test internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
111	**0**	**Low level of power supply**	Insufficient mains voltage
112	**0**	**Reset power supply voltage**	Error code for the carrying out of a reset in the event of power supply restoration (absence of error)
113	**#**	**Mains voltage supervision internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
115	**#**	**Control box meter internal error**	
116	**0**	**Life cycle of the control box in the critical interval**	The envisaged life cycle of the control box has been exceeded. Replace it.
117	**0**	**Life cycle of the control box exceeded**	The switch-off threshold has been reached.
120	**0**	**Interruption of fuel limiting meter input**	Too many disturbance impulses on the input of the fuel meter. Improve the electromagnetic compatibility.
121 - 124	**#**	**EEPROM access internal error**	Carry out a reset, repeat and check the last setting of the parameters. Restore the group of parameters. If the error arises repeatedly, replace the control box.
125	**#**	**EEPROM reading access internal error**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
126	**#**	**EEPROM writing access internal error**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
127	**#**	**EEPROM access internal error**	Carry out a reset, repeat and check the last setting of the parameters. Restore the group of parameters. If the error arises repeatedly, replace the control box.
128	**0**	**EEPROM access internal error - synchronisation during the initialisation**	Carry out a reset; If the error arises repeatedly, replace the control box.
129	**#**	**EEPROM access internal error – command synchronisation**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
130	**#**	**EEPROM access internal error - time-out**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
131	**#**	**EEPROM access internal error - page interrupted**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
132	**#**	**EEPROM register initialisation internal error**	Carry out a reset; If the error arises repeatedly, replace the control box.
133 - 135	**#**	**EEPROM access internal error – request synchronisation**	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box.
136	**1**	**Restoration started**	The restoration of a backup has been started (no error)

Error code	Diagnostic code	Meaning of the system REC27.100A2	Recommended measures
137	#	**Internal error – backup / restoration**	
	157	Restoration – OK, but backup < compared with set data of current system	Restoration successful, but the backup data installed are fewer than those currently present in the system.
	242	Backup – the backup carried out is contradictory	The backup is irregular and cannot be transferred again
	243	Backup – the data comparison between the internal microprocessors is irregular	Repeat the reset and backup
	244	The backup data are incompatible	The backup data are incompatible with the current version of the software; the restoration is not possible
	245	Error in access to the parameter Restore_Complete	Repeat the reset and backup
	246	Restoration – time-out during logging in EEPROM	Repeat the reset and backup
	247	The data received are contradictory	The series of backup data is not valid; restoration is not possible
	248	The restoration cannot currently be carried out	Repeat the reset and backup
	249	Restoration – interruption caused by inadequate identification of the burner	The backup has an inadequate identification of the burner and must not be transferred to the control box
	250	Backup – The CRC of a page is not correct	The series of backup data is not valid; restoration is not possible
	251	Backup – the identification of the burner is not defined	Define the identification of the burner and repeat the backup
	252	After restoration, the pages are still in INTERRUPTION	Repeat the reset and backup
	253	The restoration cannot currently be carried out	Repeat the reset and backup
	254	Interruption owing to transmission error	Repeat the reset and backup
	255	Interruption owing to time-out during the restoration	Carry out a reset, check the connections and repeat the backup
146	#	**Time-out of the system automation interface**	Refer to the Modbus User Documentation (A7541)
	1	Modbus time-out	
	2	Reserved	
165	#	**Internal error**	
166	**0**	**Watchdog reset internal error**	
167	#	**Manual lockout**	The control box has been manually blocked (no error)
	1	Manual lockout from remote reset command	
	2	Manual lockout from Operator Panel	
	3	Manual lockout from PC interface	
168 - 171	#	**Internal error management**	Carry out a reset; if the error arises repeatedly, replace the control box
200	#	**System free of errors**	No error
201	#	**Lockout or error at start**	Lockout or error due to lack of parameter settings
	1	No operation mode selected	
	2..3	No fuel train defined	
	4..7	No curve defined	
	8..15	Standardisation speed not defined	
	16..31	Backup / restoration impossible	
202	#	**Selection of internal operation mode**	Redefine the operation mode (parameter 201)
203	#	**Internal error**	Redefine the operation mode (parameter 201) Carry out a reset; if the error arises repeatedly, replace the control box
204	**Phase number**	**Program stop**	The program stop is active (no error)
205	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
206	**0**	**Combination of control box and Operator Panel not allowed**	
207	#	**Compatibility of control box with Operator Panel**	
	0	Obsolete version of **control box**	
	1	Obsolete version of **Operator Panel**	
208-209	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
240	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
245	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box
250	#	**Internal error**	Carry out a reset; if the error arises repeatedly, replace the control box

7.1 Notes on safety for the maintenance

The periodic maintenance is essential for the good operation, safety, yield and duration of the burner.
It allows you to reduce consumption and polluting emissions and to keep the product in a reliable state over time.

The maintenance interventions and the calibration of the burner must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

Before carrying out any maintenance, cleaning or checking operations:

disconnect the electricity supply from the burner by means of the main switch of the system;

close the fuel interception tap;

7.2 Maintenance programme

Maintenance frequency

The gas combustion system should be checked **at least once a year** by a representative of the manufacturer or another specialised technician.

Checking and cleaning

Combustion
The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.
Gas leaks
Make sure there are no gas leaks on the conduit between the gas meter and the burner.
Gas filter
Replace the gas filter when it is dirty.
Flame inspection window
Clean the glass of the flame inspection window.

Combustion head
Open the burner and make sure that all the components of the combustion head are:
- undamaged;
- not deformed due to high temperature;
- free of ambient dirt or dust;
- free of rusted materials;
- adequately positioned.

Make sure that the gas outlet holes for the start-up, on the combustion head distributor, are free of dirt or rust deposits.
In case of doubt, disassemble the elbow 5)(Fig. 39).
Combustion
Adjust the burner if the combustion values found at the beginning of the operation do not comply with the Regulations in force or, at any rate, do not produce good combustion.
Use the appropriate card to record the new combustion values; they will be useful for subsequent controls.

7.3 Opening the burner

➤ **Disconnect the electrical supply from the burner.**
➤ Loosen the 4 screws 1) and remove the hood 2).
➤ Assemble the two extensions supplied on the guides 4) (versions TL).
➤ Disconnect the plug 7) and loosen the cable grommet 8);
➤ Disconnect the socket from the maximum gas pressure switch;
➤ Remove the screws 3) and pull back the burner on the guides 4) by about 100 mm. Disconnect the cables of the probe and electrode, then pull the burner back completely.

At this point it is possible to extract the inner part 5) after having removed the screw 6).

7.4 Closing the burner

➤ Push the burner up to approximately 100 mm from the pipe coupling.
➤ Reinsert the cables and slide the burner as far as the stop.
➤ Connect the plug of the servomotor 7) and tighten the grommet 8).
➤ Connect the socket of the maximum gas pressure switch.
➤ Replace the screws 3) and carefully pull the probe and electrode cables outwards until they are slightly taut.
➤ Disassemble the two extensions from the guides 4).

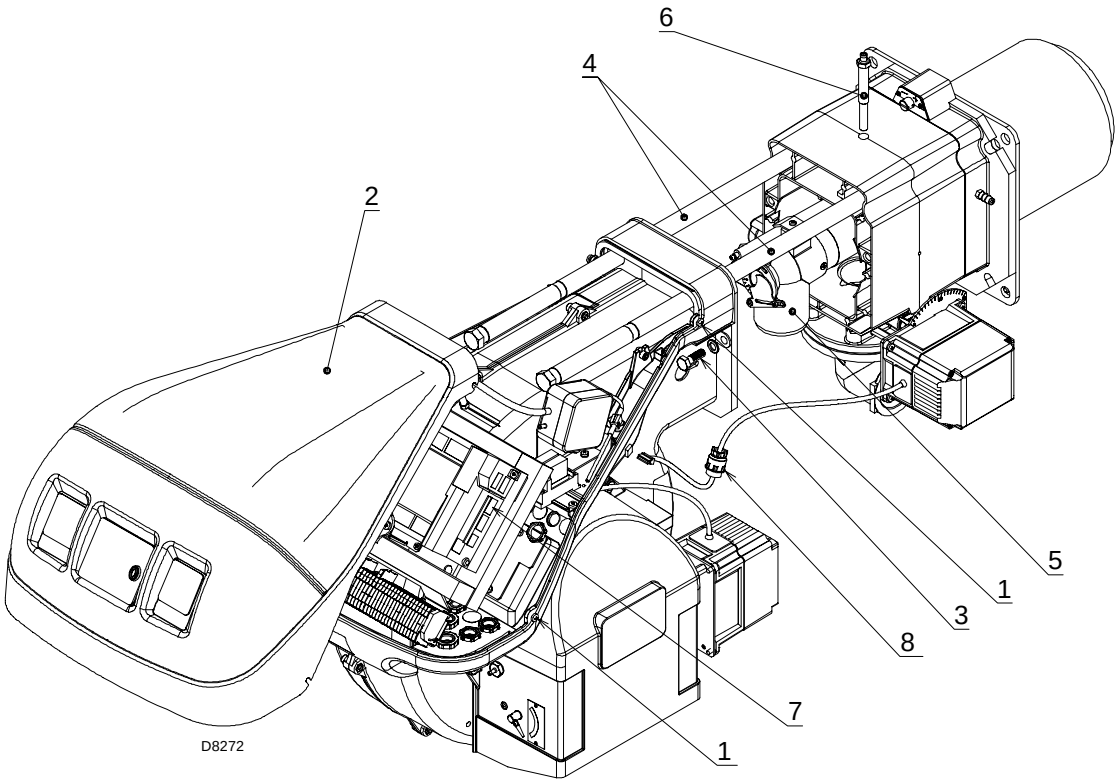
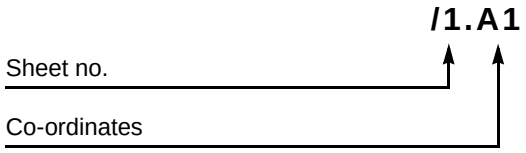


Fig. 39

1	**Index of layouts**
2	Indication of references
3	Functional layout REC27...
4	Functional layout REC27...
5	Functional layout REC27...
6	Electrical wiring that the installer is responsible for
7	Functional layout RWF40...

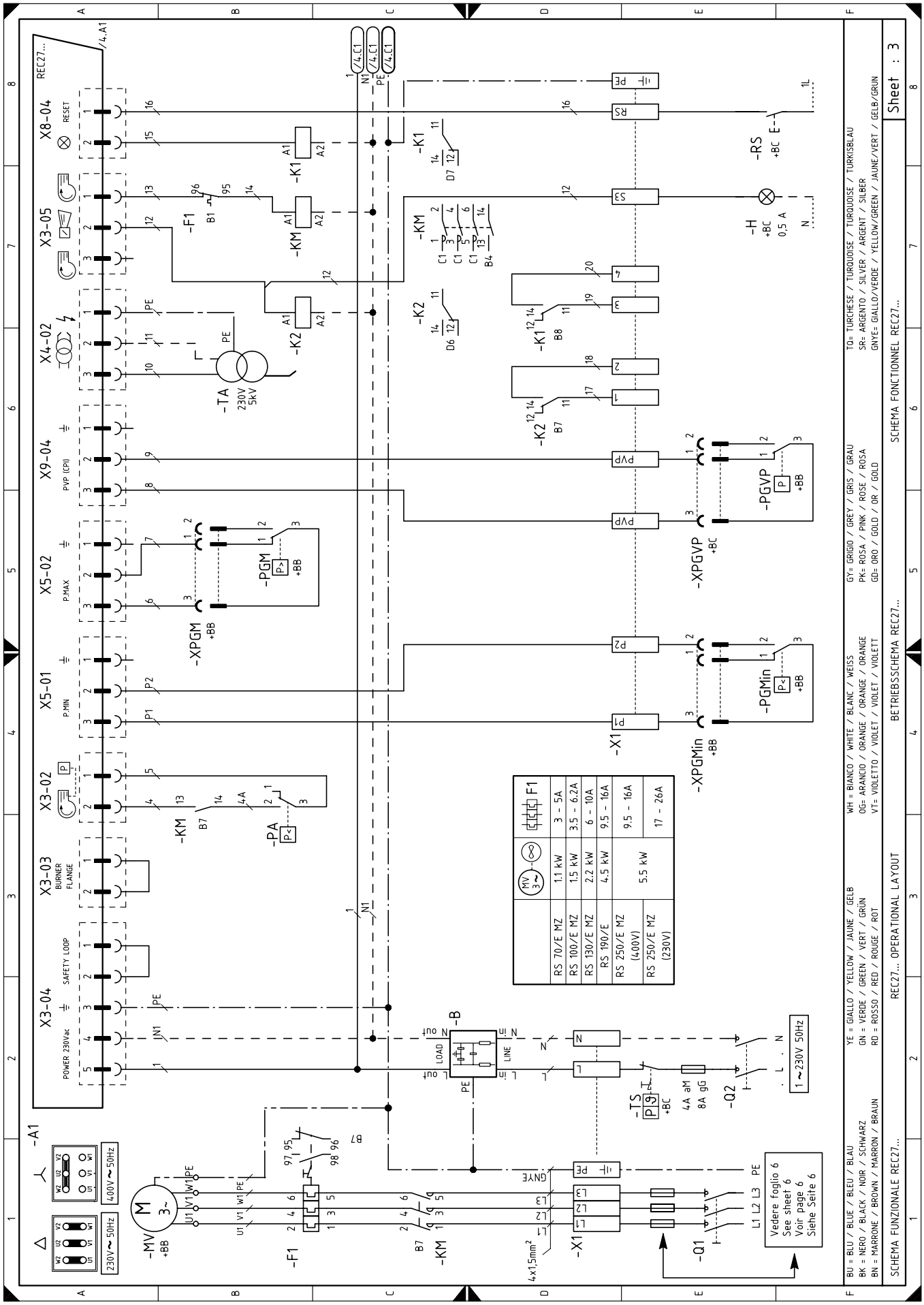
2 Indication of references

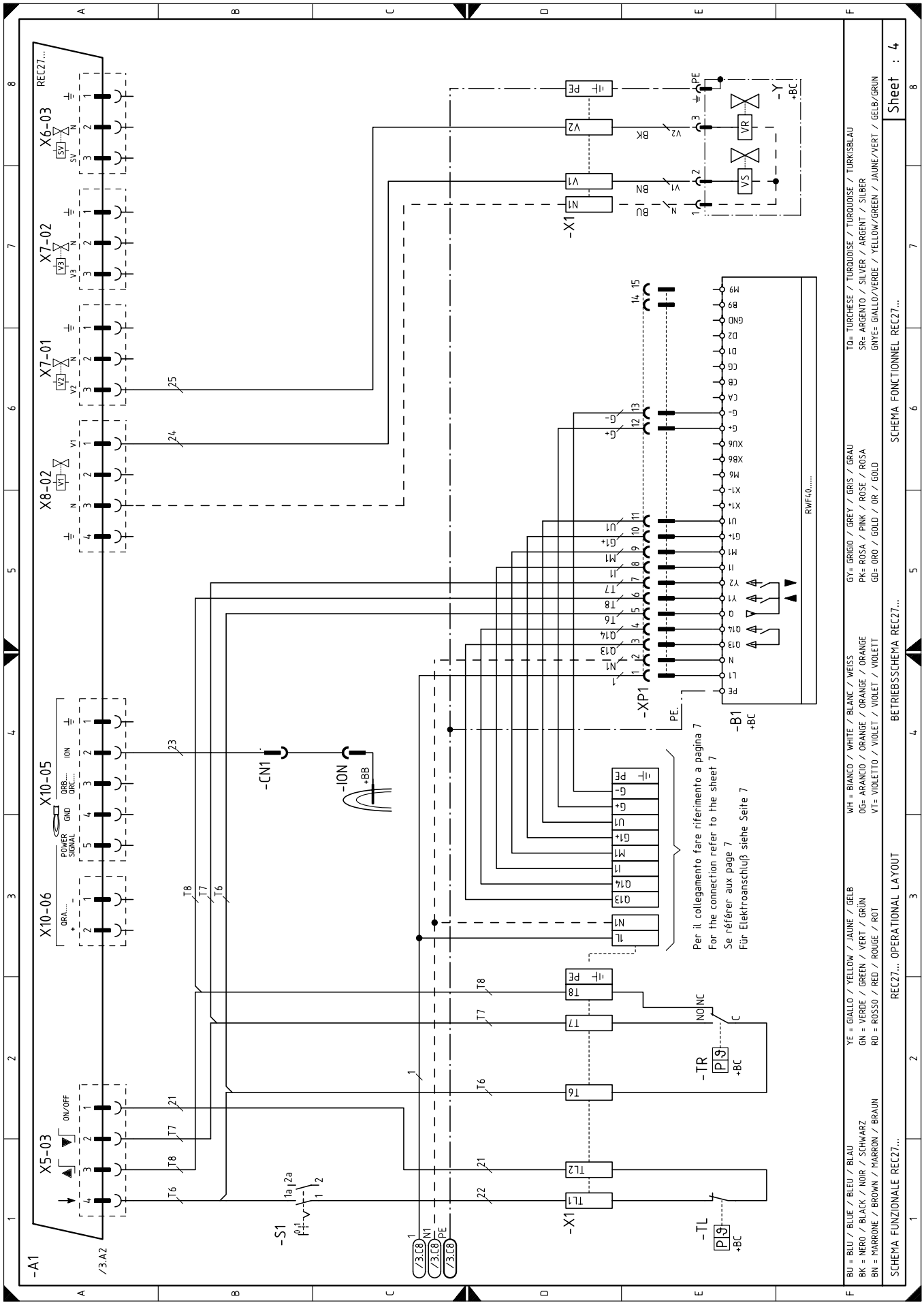


Wiring layout key

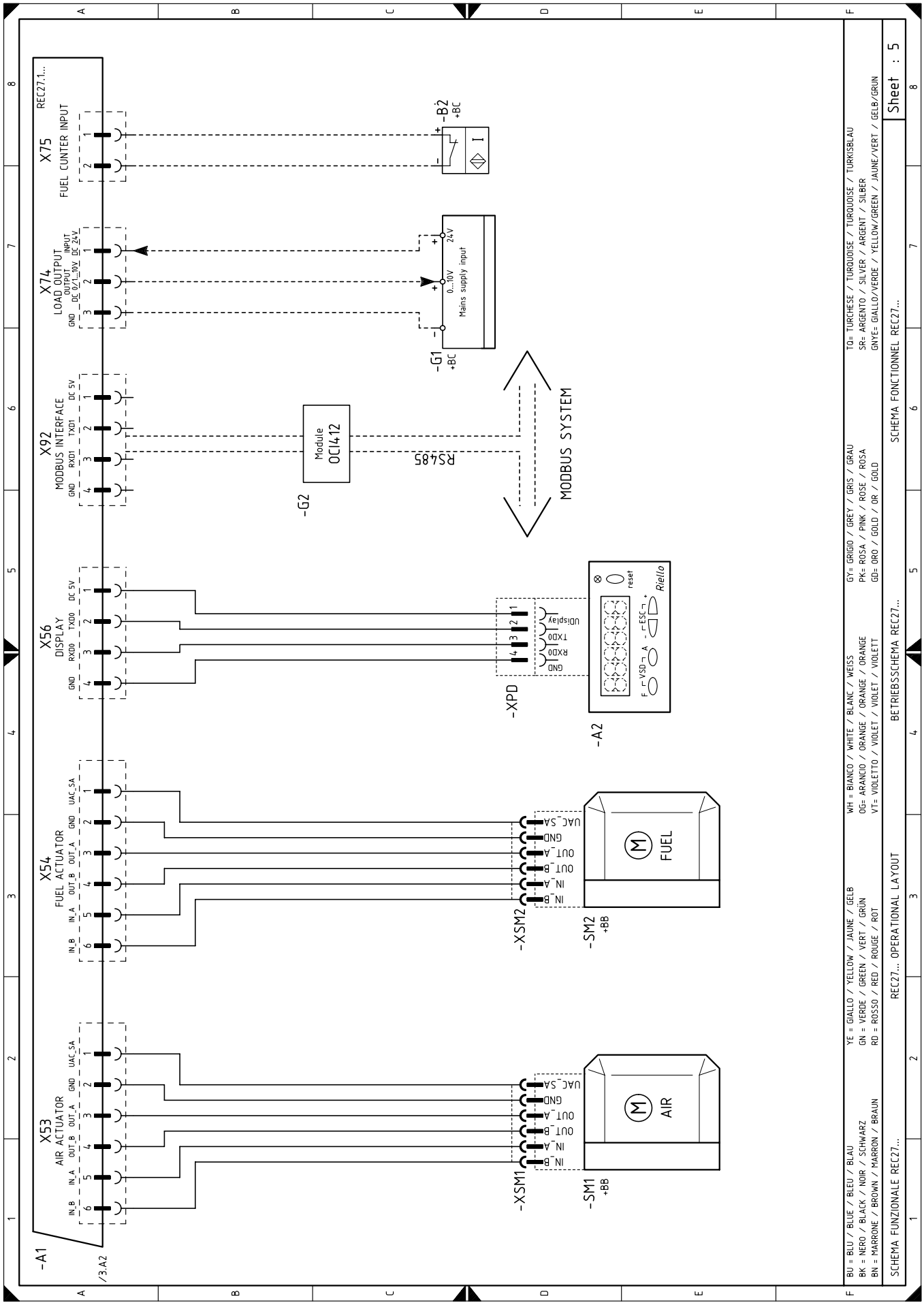
A1 - Control box for the air/fuel ratio
A2 - Operator Panel
+BB - Burner components
+BC - Boiler components
B - Filter to protect against radio disturbance
B1 - Output regulator RWF40
B2 - Fuel meter
BA - Input in current DC 4...20 mA
BA1 - Input in current DC 4...20 mA to modify remote setpoint
BP - Pressure probe
BP1 - Pressure probe
BR - Remote setpoint potentiometer
BT1 - Thermocouple probe
BT2 - Probe Pt100, 2 wires
BT3 - Probe Pt100, 3 wires
BT4 - Probe Pt100, 3 wires
BTEXT - External probe for climatic compensation of the setpoint
BV - Input in voltage DC 0...10V
BV1 - Input in voltage DC 0...10V to modify remote setpoint
CN1 - Ionisation probe connector
F1 - Fan motor thermal relay
G1 - Load indicator
G2 - Communication interface for Modbus system
H - Remote lockout signal
ION - Ionisation probe
IN - Manual burner arrest switch
K1 - Clean contacts output relay burner switched on
K2 - Clean contacts output relay burner lockout
KM - Fan motor contact maker
MV - Fan motor
PA - Air pressure switch
PE - Burner earth
PGM - Maximum gas pressure switch
PGMin - Minimum gas pressure switch
PGVP - Gas pressure switch for valve leak detection control device
Q1 - Three-phase disconnecting switch
Q2 - Single phase disconnecting switch
RS - Remote burner reset button
S1 - On/off selector
SM1 - Air servomotor
SM2 - Gas servomotor
TA - Ignition transformer
TL - Limit thermostat/pressure switch
TR - Adjustment thermostat/pressure switch
TS - Safety thermostat/pressure switch
X1 - Burner terminal strip
XP1 - Connector for output power regulator kit RWF40
XPD - Operator Panel connector
XPGM - Maximum gas pressure switch connector
XPGVP - Gas pressure switch connector for valve leak detection control device
XRWF - Terminal board for output power regulator RWF40
Y - Gas adjustment valve + gas safety valve

Appendix - Electrical panel layout




SCHEMA FUNZIONALE REC27...
REC27... OPERATIONAL LAYOUT
BETRIEBSSCHEMA REC27...
SCHEMA FONCTIONNEL REC27...
Sheet : 4
-A1
-X5-03
-X10-06
-X10-05
-X8-02
-X7-01
-X7-02
-X6-03
-X1
-XP1
-B1
-CN1
-ION
-S1
-TR
-TL
-Y
Per il collegamento fare riferimento a pagina 7
For the connection refer to the sheet 7
Se référer aux page 7
Für Elektroanschluß siehe Seite 7
BU = BLU / BLUE / BLEU / BLAU
BK = NERO / BLACK / NOIR / SCHWARZ
BN = MARRONE / BROWN / MARRON / BRAUN
YE = GIALLO / YELLOW / JAUNE / GELB
GN = VERDE / GREEN / VERT / GRÜN
RD = ROSSO / RED / ROUGE / ROT
WH = BIANCO / WHITE / BLANC / WEISS
OG= ARANCIO / ORANGE / ORANGE / ORANGE
VT= VIOLETTO / VIOLET / VIOLET / VIOLETT
GY= GRIGIO / GREY / GRIS / GRAU
PK= ROSA / PINK / ROSE / ROSA
GD= ORO / GOLD / OR / GOLD
TQ= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU
SR= ARGENTO / SILVER / ARGENT / SILBER
GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

RIELLO


-A1
/3.A2
X53
AIR ACTUATOR
IN_B IN_A OUT_B OUT_A GND UAC_SA
X54
FUEL ACTUATOR
IN_B IN_A OUT_B OUT_A GND UAC_SA
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X92
MODBUS INTERFACE
GND RXD1 TXD1 DC 5V
X74
LOAD OUTPUT
GND DC 0/1..10V OUTPUT INPUT DC 24V
X75
FUEL CUNTER INPUT
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-XSM2
-XPD
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Mains supply input
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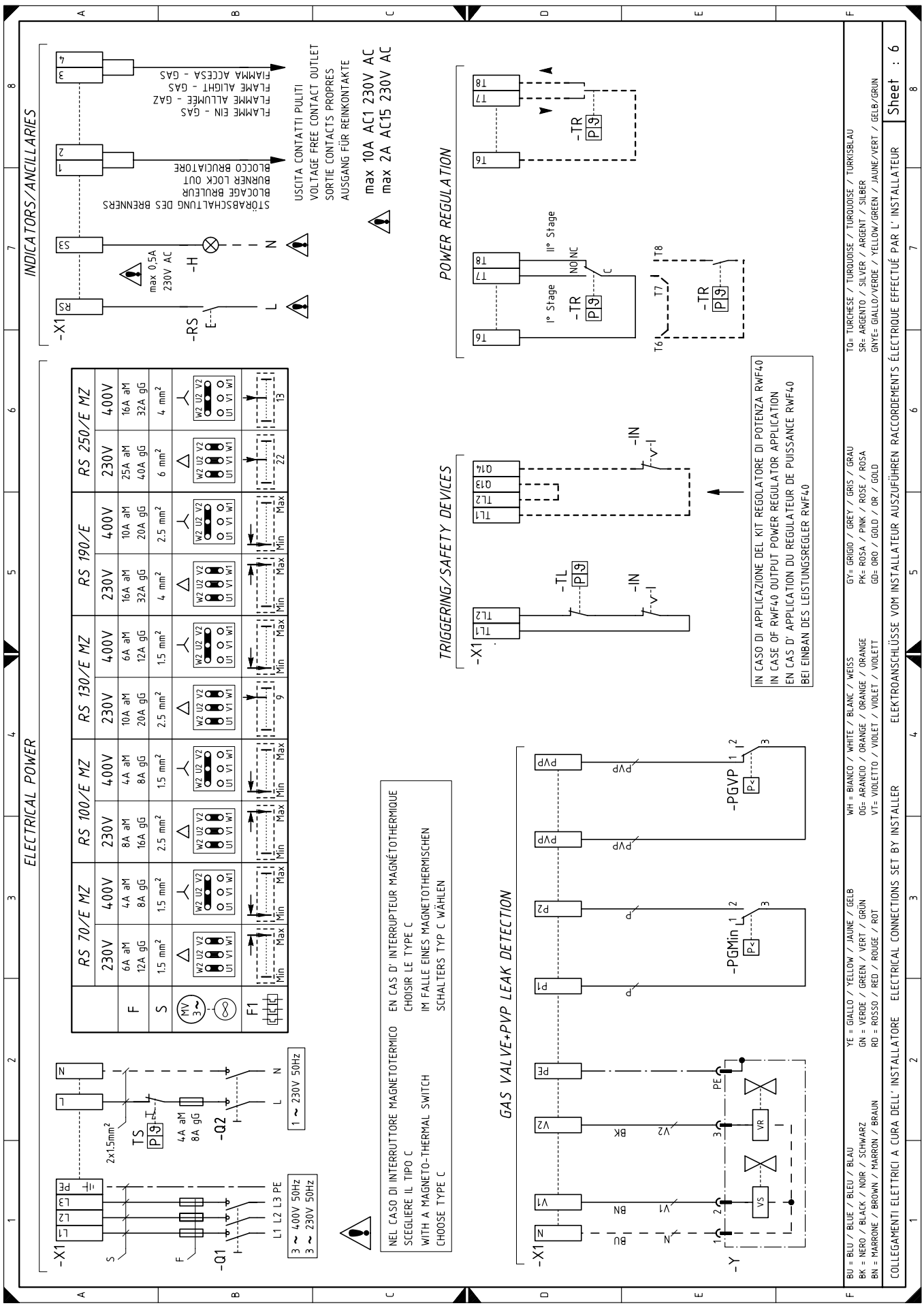
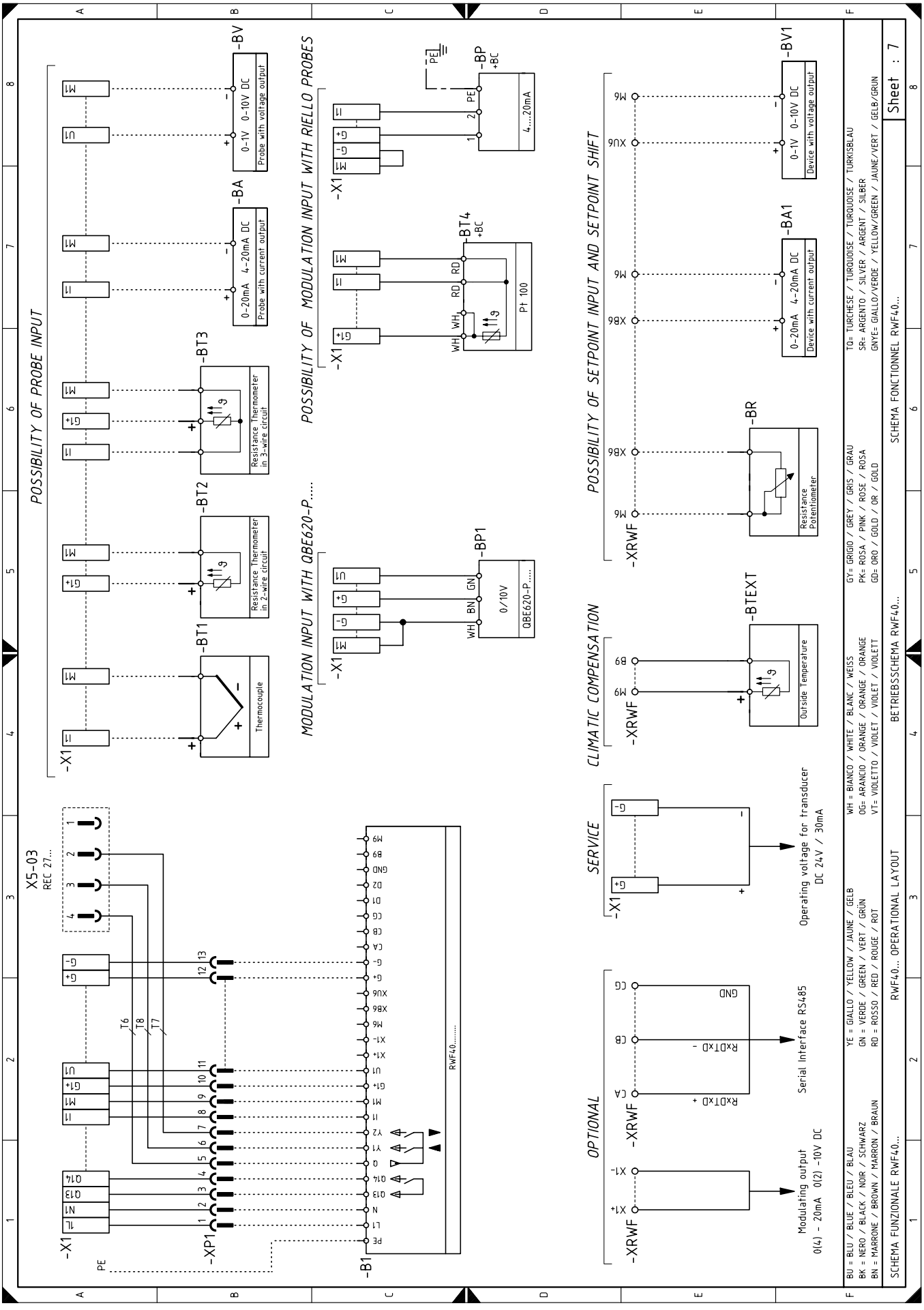
Riello
reset
Sheet : 5
SCHEMA FUNZIONALE REC27...
REC27... OPERATIONAL LAYOUT
BETRIEBSSCHEMA REC27...
SCHEMA FONCTIONNEL REC27...
BU = BLU / BLUE / BLEU / BLAU
BK = NERO / BLACK / NOIR / SCHWARZ
BN = MARRONE / BROWN / MARRON / BRAUN
YE = GIALLO / YELLOW / JAUNE / GELB
GN = VERDE / GREEN / VERT / GRÜN
RD = ROSSO / RED / ROUGE / ROT
WH = BIANCO / WHITE / BLANC / WEISS
OG= ARANCIO / ORANGE / ORANGE / ORANGE
VT= VIOLETTO / VIOLET / VIOLET / VIOLETT
GY= GRIGIO / GREY / GRIS / GRAU
PK= ROSA / PINK / ROSE / ROSA
GD= ORO / GOLD / OR / GOLD
TQ= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU
SR= ARGENTO / SILVER / ARGENT / SILBER
GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN


INDICATORS/ANCILLARIES
ELECTRICAL POWER
POWER REGULATION
TRIGGERING/SAFETY DEVICES
GAS VALVE+PVP LEAK DETECTION
STÖRABSCHALTUNG DES BRENNERS
BLOCAGE BRULEUR
BURNER LOCK OUT
BLOCCO BRUCIATORE
FLAMME EIN - GAS
FLAMME ALLUMÉE - GAZ
FLAME ALIGHT - GAS
FIAMMA ACCESA - GAS
USCITA CONTATTI PULITI
VOLTAGE FREE CONTACT OUTLET
SORTIE CONTACTS PROPRES
AUSGANG FÜR REINKONTAKTE
max 10A AC1 230V AC
max 2A AC15 230V AC
max 0,5A 230V AC
I° Stage
II° Stage
RS 70/E MZ
RS 100/E MZ
RS 130/E MZ
RS 190/E
RS 250/E MZ
NEL CASO DI INTERRUTTORE MAGNETOTERMICO EN CAS D' INTERRUPTEUR MAGNÉTOTHERMIQUE
SCEGLIERE IL TIPO C CHOISIR LE TYPE C
WITH A MAGNETO-THERMAL SWITCH IM FALLE EINES MAGNETOTHERMISCHEN
CHOOSE TYPE C SCHALTERS TYP C WÄHLEN
IN CASO DI APPLICAZIONE DEL KIT REGOLATORE DI POTENZA RWF40
IN CASE OF RWF40 OUTPUT POWER REGULATOR APPLICATION
EN CAS D' APPLICATION DU REGULATEUR DE PUISSANCE RWF40
BEI EINBAN DES LEISTUNGSREGLER RWF40
BU = BLU / BLUE / BLEU / BLAU
BK = NERO / BLACK / NOIR / SCHWARZ
BN = MARRONE / BROWN / MARRON / BRAUN
YE = GIALLO / YELLOW / JAUNE / GELB
GN = VERDE / GREEN / VERT / GRÜN
RD = ROSSO / RED / ROUGE / ROT
WH = BIANCO / WHITE / BLANC / WEISS
OG= ARANCIO / ORANGE / ORANGE / ORANGE
VT= VIOLETTO / VIOLET / VIOLET / VIOLETT
GY= GRIGIO / GREY / GRIS / GRAU
PK= ROSA / PINK / ROSE / ROSA
GD= ORO / GOLD / OR / GOLD
TQ= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU
SR= ARGENTO / SILVER / ARGENT / SILBER
GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
COLLEGAMENTI ELETTRICI A CURA DELL' INSTALLATORE ELECTRICAL CONNECTIONS SET BY INSTALLER ELEKTROANSCHLÜSSE VOM INSTALLATEUR AUSZUFÜHREN RACCORDEMENTS ÉLECTRIQUE EFFECTUÉ PAR L' INSTALLATEUR
Sheet : 6


POSSIBILITY OF PROBE INPUT
MODULATION INPUT WITH QBE620-P.....
POSSIBILITY OF MODULATION INPUT WITH RIELLO PROBES
POSSIBILITY OF SETPOINT INPUT AND SETPOINT SHIFT
CLIMATIC COMPENSATION
SERVICE
OPTIONAL
-BV
-BA
-BT3
-BT2
-BT1
-BP1
-BP
-BT4
-BV1
-BA1
-BR
-BTEXT
-X1
-XP1
-B1
-XRWF
-XRWF
X5-03
REC 27...
RWF40.....
Thermocouple
Resistance Thermometer in 2-wire circuit
Resistance Thermometer in 3-wire circuit
0-1V 0-10V DC
Probe with voltage output
0-20mA 4-20mA DC
Probe with current output
0/10V
QBE620-P.....
Pt 100
4....20mA
Device with voltage output
Device with current output
Resistance Potentiometer
Outside Temperature
Operating voltage for transducer DC 24V / 30mA
Serial Interface RS485
Modulating output 0(4) - 20mA 0(2) -10V DC
BU = BLU / BLUE / BLEU / BLAU
BK = NERO / BLACK / NOIR / SCHWARZ
BN = MARRONE / BROWN / MARRON / BRAUN
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SCHEMA FUNZIONALE RWF40... RWF40... OPERATIONAL LAYOUT BETRIEBSSCHEMA RWF40... SCHEMA FONCTIONNEL RWF40...
Sheet : 7

Output power regulator kit for modulating operation

With the modulating operation, the burner continually adapts the power to the request for heat, ensuring great stability for the parameter controlled: temperature or pressure.
Two components should be ordered:
• the output regulator to install on the burner;
• the probe to install on the heat generator.

Parameter to be checked		Probe		Output Regulator	
	Adjustment field	Type	Code	Type	Code
Temperature	- 100...+ 500°C	PT 100	3010110	RWF40	3010414
Pressure	0...2.5 bar 0...16 bar	Output probe 4...20 mA	3010213 3010214		

Software interface Kit (ACS410 + OCI410.30) - Service Level

Code **3010436**

Modbus interface Kit (OCI412)

Code **3010437**

Gas trains in compliance with standard EN 676 (complete with valves, pressure adjuster and filter)
Gas train - burner adapters

Gas train			Gas train coupling on burner					Gas train - burner adapter
Code	Model	Ø	RS 70/E	RS 100/E	RS 130/E	RS 190/E	RS 250/E	Code
3970256	Multibloc MB DLE 412 S52	1”1/4	•	•				3010126
3970250	Multibloc MB DLE 415 S52	1”1/2	•	•	•	•	•	3000843
3970252	Multibloc MB DLE 420 S52	2”	•	•	•	•	•	-
3970221	MBC-1200-SE -50	2”	•	•	•	•	•	-
3970222	MBC-1900-SE-65 FC	DN 65	•	•	•	•	•	3000825
3970223	MBC-3100-SE-80 FC	DN 80			•	•	•	3000826

PVP Kit (Pressure Valve Proving)

Code **3010344** for RS 70/E MZ and RS 100/E MZ

Note: for RS 130/E MZ, RS 190/E and RS 250/E MZ, the Kit is supplied as standard equipment with the burner.

Continuous Purging Kit

Code **3010094**

Pipes Kit (for flame inversion boilers)

Burner	Combustion head	Kit Code
RS 70/E MZ	TC	in progress
RS 70/E MZ	TL	
RS 100/E MZ	TC	in progress
RS 100/E MZ	TL	
RS 130/E MZ	TC	in progress
RS 130/E MZ	TL	in progress
RS 190/E	TC	3010375
RS 250/E MZ	TC	-
RS 250/E MZ	TL	-

Kit for LPG operation

Burner	Combustion head	Kit Code	Obtainable output with the Kit
RS 70/E MZ	TC	in progress	242 - 814 kW
RS 70/E MZ	TL	in progress	
RS 100/E MZ	TC	in progress	349 - 1163 kW
RS 100/E MZ	TL	in progress	
RS 130/E MZ	TC	in progress	466 - 1512 kW
RS 130/E MZ	TL	in progress	
RS 190/E	TC	3010166	465 - 2290 kW
RS 250/E MZ	TC	3010411	600 - 2700 kW
RS 250/E MZ	TL		

Kit for TOWN GAS operation - not CE type-approved

Burner	Combustion head	Kit Code
RS 70/E MZ	TC	in progress
RS 70/E MZ	TL	
RS 100/E MZ	TC	in progress
RS 100/E MZ	TL	
RS 130/E MZ	TC	in progress
RS 130/E MZ	TL	
RS 190/E	TC	3010297
RS 250/E MZ	TC	-
RS 250/E MZ	TL	

Long Head Kit

Burner	Kit Code	Standard head length	Head length obtained with the kit
RS 70/E MZ	in progress	250 mm	385 mm
RS 100/E MZ	in progress	250 mm	385 mm
RS 130/E MZ	in progress	280 mm	415 mm
RS 190/E	3010443	372 mm	530 mm
RS 250/E MZ	3010412	370 mm	520 mm

The adjacent tables show minimum load losses along the gas supply line depending on the maximum burner output operation.

Column 1
Load loss at combustion head.
Gas pressure measured at the test point 1)(Fig. 40), with:
- Combustion chamber at 0 mbar;
- Burner working at maximum output;
- Combustion head adjusted according to the diagram of Fig. 17.

Column 2
Load loss at gas butterfly valve 2)(Fig. 40) with maximum opening: 90°.

Column 3
Load loss at train 3)(Fig. 40) including: adjustment valve VR, safety valve VS (both fully open), pressure adjuster R, filter F.

The values shown in the tables refer to:
natural gas G 20 PCI 9.45 kWh/Sm^3
(8.2 Mcal/Sm^3)
With:
natural gas G 25 PCI 8.13 kWh/Sm^3
(7.0 Mcal/Sm^3) multiply the values of the tables:
- columns 1-2: by 1.5;
- column 3: by 1.35.

To know the approximate output at which the burner is operating at its maximum:
- Subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 40).
- Find, in the table relating to the burner concerned, column 1, the pressure value closest to the result you want.
- Read the corresponding output on the left.

Example - RS 190/E:
- Maximum output operation
- Natural gas G 20 PCI 9.45 kWh/Sm^3
- Combustion head adjusted according to the diagram of Fig. 17.
- Gas pressure at test point 1)(Fig. 40) = 14.5 mbar
- Pressure in combustion chamber = 3.0 mbar

14.5 - 3.0 = 11.5 mbar

A maximum output of 2000 kW shown in Table RS 190/E corresponds to 11.5 mbar pressure, column 1.
This value serves as a rough guide; the effective output must be measured at the gas meter.

To know the required gas pressure at test point 1)(Fig. 40), set the maximum output required from the burner operation, then:
- Find the nearest output value in the table for the burner in question.
- Read, on the right (column 1) the socket pressure 1)(Fig. 40).
- Add this value to the estimated pressure in the combustion chamber.

Example - RS 190/E:
- Maximum output required: 2000 kW
- Natural gas G 20 PCI 9.45 kWh/Sm^3
- Combustion head adjusted according to the diagram of Fig. 17.
- Gas pressure at output of 2000 kW, taken from table RS 190/E, column 1 = 11.5 mbar
- Pressure in combustion chamber = 3.0 mbar

11.5 + 3.0 = 14.5 mbar
pressure required at test point 1)(Fig. 40).

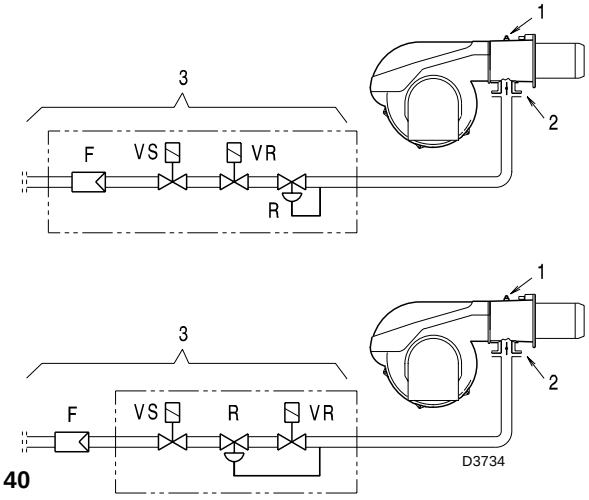

Fig. 40

RS 70/E MZ Δp (mbar)

kW	1	2	3				
			Ø 1"1/4 3970256	Ø 1"1/2 3970250	Ø 2" 3970252	Ø 2" 3970221	DN 65 3970222
465							
500			19.9	10.[illegible]	7.0	4.2	3.6
550			23.2	[illegible]	8.2	4.4	3.7
600			26.7	13.2	9.5	4.6	3.9
650			30.3	14.7	10.8	4.9	4.1
700			34.0	16.4	12.1	5.1	4.2
750			37.7	18.0	13.4	5.4	4.4
800			41.5	19.9	14.8	5.8	4.6
814							

RS 100/E MZ Δp (mbar)

kW	1	2	3				
			Ø 1"1/4 3970256	Ø 1"1/2 3970250	Ø 2" 3970252	Ø 2" 3970221	DN 65 3970222
695							
700			34.0	16.4	12.1	5.1	4.2
750			37.7	18.0	13.4	5.4	4.4
800			41.5	19.9	14.8	5.8	4.6
850							
900							
1000				27.7	20.6	8.9	5.5
1100							
1163							

RS 130/E MZ Δp (mbar)

kW	1	2	3				
			Ø 1"1/2 3970250	Ø 2" 3970252	Ø 2" 3970221	DN 65 3970222	DN 80 3970223
930			25.0	18.6	8.2	5.2	3.9
1000			27.7	20.6	8.9	5.5	4.0
1100			31.9	23.8	10.2	6.1	4.3
1200			36.1	27.2	11.6	6.7	4.6
1300			40.5	30.9	13.1	7.3	4.9
1400			45.9	35.2	15.0	8.1	5.2
1500			[illegible]	39.6	17.0	8.9	5.5
1512							

RS 190/E Δp (mbar)

kW	1	2	3				
			Ø 1"1/2 3970250	Ø 2" 3970252	Ø 2" 3970221	DN 65 3970222	DN 80 3970223
1280	9.6	1.3	39.5	30.0	12.7	7.1	4.8
1400	9.7	1.6	45.9	35.2	15.0	8.1	5.2
1600	9.8	2.1	56.5	43.9	19.0	9.8	5.8
1800	9.9	2.7	67.2	52.7	23.1	11.5	6.5
2000	11.5	3.3	-	62.2	27.5	13.5	7.3
2100	12.6	3.6	-	67.6	30.0	14.6	7.7
2290	14.9	4.3	-	77.8	34.8	16.9	8.6

RS 250/E MZ Δp (mbar)

kW	1	2	3				
			Ø 1"1/2 3970250	Ø 2" 3970252	Ø 2" 3970221	DN 65 3970222	DN 80 3970223
1250	5.2	1.3	38.2	28.9	12.3	6.9	4.7
1500	7.2	1.8	51.2	39.6	17.0	8.9	5.5
1750	9.3	2.5	64.5	50.5	22.0	11.1	6.3
2000	11.3	3.3	-	62.2	27.5	13.5	7.3
2250	14.1	4.2	-	75.7	33.8	16.4	8.5
2500	17.0	5.1	-	-	40.2	19.3	9.7
2650	19.4	5.8	-	-	45.0	21.2	10.5

in progress
in progress
in progress

Appendix - Firing rate on basis of air density

The firing rate of the burner shown in the manual is valid for a room temperature of 20 °C and an altitude of 0 m above sea level (barometric pressure around 1013 mbar).

It may be that a burner has to operate with combustive air at a higher temperature and/or higher altitudes.

The heating of the air and the increase in altitude produce the same effect: the expansion of the air volume (i.e. the reduction of its density).

The delivery of the burner fan remains essentially the same, but the oxygen per m^3 of air, and the thrust (discharge head) of the fan are reduced.

It is therefore important to know if the maximum output requested from the burner at a determinate combustion chamber pressure remains within the firing rate of the burner even with the changed temperature and altitude conditions.
To check it, proceed as follows:

1 - Find the corrective factor F (relating to the air temperature and altitude of the system) in the table alongside.
2 - Divide the output Q required from the burner by F to obtain the equivalent output Qe:

Qe = Q : F (kW)

3 - In the firing rate of the burner, mark the work point identified by:
Qe = equivalent output
H1 = pressure in combustion chamber
point A that must remain within the firing rate (Fig. 41).

4 - Trace a vertical line from point A, Fig. 41, and find the maximum pressure H2 of the firing rate.
5 - Multiply H2 by F to obtain the maximum lowered pressure H3 of the firing rate

H3 = H2 x F (mbar)

If H3 is greater than H1, as in Fig. 41, the burner can produce the delivery requested.
If H3 is less than H1, it is necessary to reduce the output of the burner. The reduction in output is accompanied by a reduction in the combustion chamber pressure:
Qr = reduced output
H1r = reduced pressure

$$H1r = H1 \times \left(\frac{Qr}{Q}\right)^2$$

Example, 5% reduction in output:

Qr = Q x 0.95

H1r = H1 x $(0.95)^2$

With the new values - Qr and H1r - repeat steps 2 - 5.

Warning:
the combustion head should be adjusted in relation to the equivalent output Qe.

Altitude	Average barometric pressure	F							
		Air temperature °C							
m. above sea level	mbar	0	5	10	15	20	25	30	40
0	1013	1.087	1.068	1.049	1.031	1.013	0.996	0.980	0.948
100	1000	1.073	1.054	1.035	1.017	1.000	0.983	0.967	0.936
200	989	1.061	1.042	1.024	1.006	0.989	0.972	0.956	0.926
300	978	1.050	1.031	1.013	0.995	0.978	0.962	0.946	0.916
400	966	1.037	1.018	1.000	0.983	0.966	0.950	0.934	0.904
500	955	1.025	1.007	0.989	0.972	0.955	0.939	0.923	0.894
600	944	1.013	0.995	0.977	0.960	0.944	0.928	0.913	0.884
700	932	1.000	0.982	0.965	0.948	0.932	0.916	0.901	0.872
800	921	0.988	0.971	0.954	0.937	0.921	0.906	0.891	0.862
900	910	0.977	0.959	0.942	0.926	0.910	0.895	0.880	0.852
1000	898	0.964	0.946	0.930	0.914	0.898	0.883	0.868	0.841
1200	878	0.942	0.925	0.909	0.893	0.878	0.863	0.849	0.822
1400	856	0.919	0.902	0.886	0.871	0.856	0.842	0.828	0.801
1600	836	0.897	0.881	0.866	0.851	0.836	0.822	0.808	0.783
1800	815	0.875	0.859	0.844	0.829	0.815	0.801	0.788	0.763
2000	794	0.852	0.837	0.822	0.808	0.794	0.781	0.768	0.743
2400	755	0.810	0.796	0.782	0.768	0.755	0.742	0.730	0.707
2800	714	0.766	0.753	0.739	0.726	0.714	0.702	0.690	0.668
3200	675	0.724	0.711	0.699	0.687	0.675	0.664	0.653	0.632
3600	635	0.682	0.669	0.657	0.646	0.635	0.624	0.614	0.594
4000	616	0.661	0.649	0.638	0.627	0.616	0.606	0.596	0.577

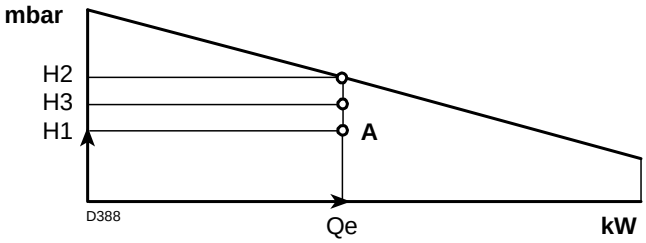

Fig. 41

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http:// www.riello.it
http:// www.rielloburners.com

Subject to modifications